

NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

19980512 051

**HANDHELD COMPUTER APPLICATIONS
IN THE NAVY COMMAND ENVIRONMENT**

by

Robert D. Surovchak

March, 1998

Thesis Advisor:
Associate Advisor:

Rudolph Darken
Douglas E. Brinkley

Approved for public release; distribution is unlimited.

DTIC QUALITY INSPECTED 3

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE March 1998		3. REPORT TYPE AND DATES COVERED Master's Thesis
4. TITLE AND SUBTITLE HANDHELD COMPUTER APPLICATIONS IN THE NAVY COMMAND ENVIRONMENT			5. FUNDING NUMBERS	
6. AUTHOR(S) Surovchak, Robert D.				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Marine Corps Tactical Systems Support Activity (MCTSSA), Box 5171, Camp Pendleton, CA 92055-5080			10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.			12b. DISTRIBUTION CODE	
13. ABSTRACT (maximum 200 words) As society becomes increasingly information-oriented, the drive for more capable machines to retrieve, store, process and present such information anywhere, at anytime becomes paramount to success. This is true of United States Navy and Marine Corps officers who must manage large amounts of information while operating in remote areas. Today's very small, portable computers known as "palmtops" are capable of running powerful scaled-down versions of contemporary operating systems. When coupled with a transmission medium, palmtops represent a portable computer that can be used to communicate and process information in ad hoc environments. The Naval Postgraduate School Staff Officer Palmtop Computer Project is designed to analyze the effectiveness of Windows CE-based palmtop computers as an aide to professional Naval officers. The study project provides Naval officers with a popular palmtop computer and allows them to use the device for a four week period. During this time participants are encouraged to use the palmtop for work and personal information tasks. The primary complaints with these devices are ergonomically oriented. There is no convenient and reliable method of data entry and they cannot be easily carried while in uniform. Results from the study indicate that current Windows CE "handheld PCs" are not appropriate for use in this capacity. Recommendations for more useful portable personal computers complete this research.				
14. SUBJECT TERMS Mobile Computing, Handheld Computers, Palmtop Computers, Windows CE			15. NUMBER OF PAGES 327	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL	

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18

Approved for public release; distribution is unlimited

**HANDHELD COMPUTER APPLICATIONS
IN THE NAVY COMMAND ENVIRONMENT**

Robert D. Surovchak
Lieutenant, United States Navy
B.S., Pennsylvania State University, 1990

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

from the

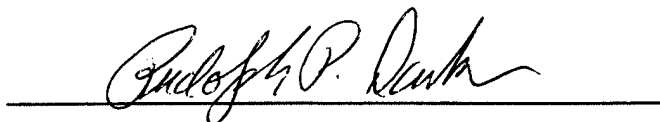
**NAVAL POSTGRADUATE SCHOOL
March 1998**

Author:

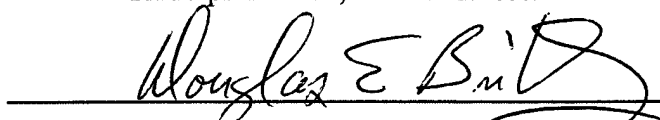


Robert D. Surovchak

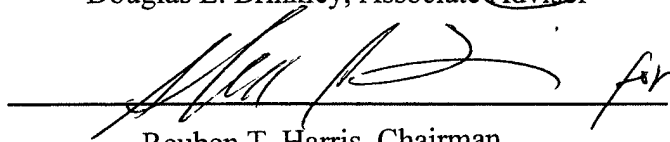
Approved by:



Rudolph Darken, Thesis Advisor



Douglas E. Brinkley, Associate Advisor



Reuben T. Harris, Chairman
Department of Systems Management

ABSTRACT

As society becomes increasingly information-oriented, the drive for more capable machines to retrieve, store, process and present such information anywhere, at anytime becomes paramount to success. This is true of United States Navy and Marine Corps officers who must manage large amounts of information while operating in remote areas. Today's very small, portable computers known as palmtops are capable of running powerful scaled-down versions of contemporary operating systems. When coupled with a transmission medium, palmtops represent a portable computer that can be used to communicate and process information in ad hoc environments. The Naval Postgraduate School Staff Officer Palmtop Computer Project is designed to analyze the effectiveness of Windows CE-based palmtop computers as an aide to professional Naval officers. The study project provides Naval officers with a popular palmtop computer and allows them to use the device for a four week period. During this time participants are encouraged to use the palmtop for work and personal information tasks. The primary complaints with these devices are ergonomically oriented. There is no convenient and reliable method of data entry and they cannot be easily carried while in uniform. Results from the study indicate that current Windows CE "handheld PCs" are not appropriate for use in this capacity. Recommendations for more useful portable personal computers complete this research.

TABLE OF CONTENTS

I.	INTRODUCTION	1
	A. THE PERSONAL COMPUTER (PC) AND COMMUNICATIONS.....	1
	B. PALMTOP COMPUTERS	2
	C. IMPORTANCE OF MOBILE COMPUTING IN A NAVY COMMAND ENVIRONMENT.....	3
	D. IT-21 AND ITS IMPACT ON THE SCOPE OF THIS RESEARCH	4
 II.	 BACKGROUND.....	 7
	A. DEFINITIONS	7
	<i>Data Collection</i>	8
	<i>Storage</i>	8
	<i>Retrieval</i>	8
	<i>Processing</i>	8
	<i>Presentation</i>	8
	B. WORK AIDES	9
	1. <i>Personal Organizers</i>	9
	2. <i>Notepads</i>	11
	3. <i>Cellular Phones</i>	12
	4. <i>Pagers</i>	12
	5. <i>Digital Personal Communication Systems (PCS)</i>	13
	C. ERGONOMICS.....	14
	D. CONVENIENT, TIMELY ENTRY OF DATA.....	15
	E. EVOLUTION OF PERSONAL COMPUTER TECHNOLOGY	17
	1. <i>Increased capability, smaller size, lower cost</i>	19
	2. <i>Obsolescence of computer technology.</i>	20
	3. <i>Classes of Personal Computers</i>	20
	Desktop PCs.....	20
	Laptop or Notebook PCs.....	21
	Palmtop or Handheld PCs.....	21
	Hybrids (Sublaptops/Subnotebooks)	22
	F. PC AND PALMTOP OPERATING SYSTEMS	22
	1. <i>Windows 3.1/3.11</i>	23
	2. <i>Windows NT</i>	24
	3. <i>Windows 95</i>	25
	4. <i>Windows CE</i>	26
	G. COMMUNICATIONS AND CONNECTIVITY.....	27
	1. <i>Telephone</i>	28
	a. Conventional, "Plain Old Telephone Service" (POTS).....	28
	b. ISDN	29
	(1) Basic Rate Interface (BRI).....	30
	(2) Primary Rate Interface (PRI).....	30

c. Cellular Telephone	31
2. <i>Other Network Connection Methods</i>	31
a. Ethernet	32
b. Radio Frequency (RF)	32
c. Infrared	34
d. Satellite	35
3. <i>Modems</i>	36
a. Analog Modem	37
b. Digital Modem	37
c. Radio (RF) Modem	38
H. INTEROPERABILITY OF PALMTOP AND CONVENTIONAL PERSONAL COMPUTERS	39
1. <i>Windows NT Compatibility</i>	39
2. <i>Reliable Communications Interfaces Between Palmtop and Desktop Computers</i>	40
I. PORTABILITY	41
J. DURABILITY IN NAVAL ENVIRONMENT	42

III. METHODOLOGY 43

A. OVERVIEW OF NAVAL POSTGRADUATE SCHOOL STAFF OFFICER PALMTOP COMPUTING PROJECT (NPS-SOPCP)	43
B. NPS-SOPCP PROBLEM STATEMENT AND OBJECTIVES	43
C. NPS-SOPCP DATA COLLECTION	44
1. <i>Project Surveys</i>	44
a. NPS-SOPCP Survey	44
b. Palmtop Technology Survey	45
c. Survey Analyses	46
2. <i>Participant Interviews</i>	46
3. <i>Participant Journals</i>	47
4. <i>Subjective Evaluation</i>	47
D. NPS-SOPCP PERFORMANCE INDICATORS	47
1. <i>Technological Proficiency</i>	48
2. <i>Device Preference</i>	48
3. <i>Device Proficiency</i>	49
E. PROJECT PLANNING	50
1. <i>Officer Selection</i>	50
2. <i>Project Equipment</i>	51
F. IMPLEMENTATION OF NPS-SOPCP	52
a. Initial Administration of NPS-SOPCP Survey	53
b. Initial Training	53
c. Recommended Tasks	53
d. Uses for Palmtops	54
e. Journal: On-Going Comments of the Palmtop	54
f. Mid-Project Review Meeting	54

g. Initial Administration of the Palmtop Technology Survey	55
h. Final Project Meeting and Debrief	55
i. Final Administration of NPS-SOPCP Survey and Palmtop Technology Survey	56
IV. FINDINGS.....	57
A. SURVEY DATA INTERPRETATION	57
1. <i>Analysis of the NPS-SOPCP Survey</i>	57
2. <i>Analysis of the Palmtop Technology Survey</i>	59
B. DATA INTERPRETATION AND MEASUREMENT BIAS.....	61
C. BACKGROUND OF PROJECT PARTICIPANTS	62
D. PALMTOP USABILITY AND PRODUCTIVITY	63
E. OFFICERS' PREFERENCES.....	66
1. <i>Palmtop model</i>	66
2. <i>Compromises between portability (size) and capability</i>	67
3. <i>Functions provided/not provided</i>	68
F. USE OF A PALMTOP TO ASSIST IN DAILY JOB TASKS (WILLINGNESS TO USE A PALMTOP).....	69
G. PARTICIPANT'S ADDITIONAL APPLICATIONS AND FUNCTIONS ...	70
H. DATA INCONGRUENCE	70
V. CONCLUSIONS.....	73
A. SUMMARY OF FINDINGS.....	73
1. <i>Impact of IT-21 on the Use and Procurement of Palmtop Computers in the United States Navy</i>	73
2. <i>NPS-SOPCP Performance Indicators</i>	74
a. Device Preference	75
b. Device Proficiency	77
c. Additional Areas of Interest	78
3. <i>NPS-SOPCP Accomplishments</i>	79
4. <i>Benefits Accrued by NPS-SOPCP</i>	79
5. <i>Project Data Incongruence</i>	82
6. <i>Limitations of NPS-SOPCP</i>	83
7. <i>Role of the System Administrator</i>	84
B. STRENGTHS OF PALMTOP COMPUTERS	85
1. <i>Portability</i>	85
2. <i>Communications and Connectivity</i>	86
C. LIMITATIONS OF PALMTOP COMPUTERS.....	86
1. <i>Ergonomic Design Factors</i>	86
2. <i>Hardware Limitations</i>	87
3. <i>Software Limitations</i>	89
D. CONCLUSION	90

VI. RECOMMENDATIONS.....	91
A. SUGGESTED FURTHER STUDIES	91
1. <i>Comparison of Windows CE, Newton and PalmPilot.</i>	91
2. <i>Longer time period for study.</i>	92
3. <i>Conduct a similar study using Windows CE PalmPC devices.</i>	92
4. <i>Wireless Applications of Palmtops.</i>	93
B. SUGGESTED FUTURE DESIGN ASPECTS OF PALMTOPS AND DEVELOPMENT OF APPLICATIONS AND PERIPHERALS	94
1. <i>Hardware Recommendations</i>	94
a. Standardized USB connections to host PCs.....	95
b. Use of the Flash RAM card slot for wired connection.....	97
c. Integrated cellular phone capability.	97
2. <i>Ergonomic Design Recommendations</i>	98
a. Variable display orientation.	98
b. Retractable keyboard or hard cover to keep hand off keys while writing on screen.....	99
c. Voice recognition.....	100
3. <i>Software Recommendations</i>	100
a. Integrated Handwriting Recognition.....	101
b. Note-taking versus document making.....	102
c. Conversion from group scheduling applications.....	102
d. Personal financial management applications for Windows CE.....	103
C. RECOMMENDATIONS FOR CHIEF INFORMATION OFFICERS AND CONSUMERS.....	103
 APPENDICES	105
A. GLOSSARY OF TERMS	107
B. NAVAL POSTGRADUATE SCHOOL STAFF OFFICER PALMTOP COMPUTER PROJECT SURVEYS	117
<i>Part I: NPS-SOPCP Survey</i>	118
<i>Part II: NPS-SOPCP Palmtop Technology Survey</i>	174
C. ANALYSES OF NAVAL POSTGRADUATE SCHOOL STAFF OFFICERPALMTOP COMPUTER PROJECT SURVEYS	197
<i>Part I: NPS-SOPCP Survey Analysis</i>	198
<i>Part II: NPS-SOPCP Palmtop Technology Survey Analysis</i>	284
 LIST OF REFERENCES.....	309
 BIBLIOGRAPHY	311
 INITIAL DISTRIBUTION LIST	313

ACKNOWLEDGEMENT

The author would like to acknowledge the financial support of MCTSSA for allowing the purchase of the equipment necessary to generate data for this thesis. Since no research in this area had been performed to date, all data regarding the use of palmtop computers by professional Naval officers had to be produced.

The author also want to thank Dr. Rudy Darken for his expertise, guidance and efforts in making this research possible.

I. INTRODUCTION

A. THE PERSONAL COMPUTER (PC) AND COMMUNICATIONS

As society becomes increasingly information-oriented, the drive for more capable machines to retrieve, store, process and present such information anywhere, at anytime becomes paramount to success. Rapid advancements in computer technology providing additional capability in smaller products has resulted in the advent of the pocket-sized computer. There are, perhaps, as many definitions of the roles that pocket-sized computers are meant to play as there are names for them! Current palmtop computers are capable of running contemporary operating systems and programs typically run on desktop computers, while unique, less powerful operating systems have been developed for use on other palmtops. In all cases, palmtops, when coupled with a transmission medium, represent a portable computer that can be used to communicate, process and present information in ad hoc environments. This thesis will provide results of research into areas in which the palmtop computer may be useful to the professional Naval officer, explain the triumphs and downfalls of these devices and recommend further applications and remedies for the problems associated with existing models of palmtops.

An understanding of human information-related activities must be attained before an effective computer can be developed to assist in such tasks. Data-flow and work-flow analyses are the basis for this understanding. The human information process is composed of five distinct actions: collection, storage, processing, retrieval and presentation. Each of these actions entail specific thought processes and often are assisted through physical

objects. For example, collection is assisted through communications media (telephone, newspapers, computer information systems, etc.) while storage is achieved through personal information managers (organizers), notebooks, scraps of paper or even the back of the hand. In order for these devices to be useful, data entry must be convenient. This is also true of the computer that is meant to assist. Work aides as mentioned above are discussed in more detail in Chapter II, A, 1, while Chapter II, A, 2 presents the implications of convenient, timely data entry.

Throughout the history of computer development technological advances have permitted increasing capabilities with decreasing size. The original computers of the 1940's and 1950's were built using vacuum tubes which occupied entire rooms. In the 1960's the transistor led the way to mainframes which provided enormous amounts of computational power in comparatively small packages. Computers evolved into smaller mini and micro sizes with varied capabilities in the latter 1960's and 1970's. The introduction of the personal computer (PC) in the late 1970's produced the potential for computers to become a part of every household in the United States. PC's became increasingly powerful, faster and smaller during the 1980's. Laptop computers, developed in the 1980's, went into mass production in the early 1990's. These machines were the first affordable application of PC power in a mobile platform.

B. PALMTOP COMPUTERS

Today's very small, portable computers known as "palmtops" typically weigh less than four pounds and can be transported in a briefcase or shirt pocket yet package a large

amount of computational power. The pioneer in this area of mobile computing is Apple with its Newton palmtop computer and operating system. Another pioneer and the most successful product has been 3Com's PalmPilot. Each of these devices run a proprietary operating system. However, most models of palmtops currently in production use the Windows CE operating system by Microsoft. A hybrid of laptops and palmtops referred to as "sub-notebooks" allows for the use of a typical PC operating system such as Windows 95 on a platform which is slightly larger than a palmtop. When coupled with a network, the palmtop's role as a communication device is solidified. Now professional Naval officers have at their disposal the potential to communicate with virtually anybody at anytime and send and receive data from remote locations via these devices. Chapter II also provides further discussion of PC technology (Chapter II, B), operating systems (Chapter II, C), communications and connectivity (Chapter II, D) and interoperability (Chapter II, E).

C. IMPORTANCE OF MOBILE COMPUTING IN A NAVY COMMAND ENVIRONMENT

Like all military organizations, the United States Navy and Marine Corps routinely operate in remote areas and transport their communication systems wherever they go. This may result in delays in configuring networks when arriving at a location. In order to minimize the effects resulting from "down" communication networks, flexible, easily established and manageable systems are crucial. The palmtop with its many options for communications media is an effective system which allows for informal as well as formal

communications via electronic mail (email), web browsing and file transfer, through both electronic and infrared means.

D. IT-21 AND ITS IMPACT ON THE SCOPE OF THIS RESEARCH

The U.S. Navy is keenly aware of the importance of interoperable computing and communication systems. Information Technology for the 21st Century (IT-21) is its program developed to ensure compatibility of all procured information systems through standardized products. The limitation of this approach is that it specifies PRODUCTS rather than an architecture, which would permit more flexibility in procuring products. IT-21 calls for all future Navy personal computing acquisitions to be Year 2000 compliant, networkable through the Microsoft Windows NT operating system, utilize the current version of the Microsoft Office suite for word processing, spreadsheet, presentation, scheduling and email functions. These products have become a widely used standard, both within and outside of the military, which simplifies the problem of compatibility of products and systems. As stated previously, the recent trend for manufacturers of palmtops involves the use of the Microsoft Windows CE operating system. This is a scaled-down version of the company's popular Windows 95 operating system. It is also compatible with Microsoft's network operating system Windows NT. Because of this compatibility, Windows CE-based palmtops are a viable computing platform for the mobile Naval officer. Chapters II, E and V, A, 1 provide information regarding IT-21.

In order to verify the issue of compatibility and also to determine the viability of palmtop computers as an aide to the professional Naval officer, a demonstration project was conducted at a shore-based command. The project, named the Naval Postgraduate School, Staff Officer Palmtop Computer Project (NPS-SOPCP) provided data pertaining to 1) sampled Naval officers' preferences for functions provided by palmtop computers, 2) compromises between portability and functionality, 3) general willingness to expand the use of technology into daily job routines, 4) convenience of use and 5) recommendations for additional applications of palmtop computers. Five officers on the Naval Postgraduate School Staff and the Naval Support Activity, Monterey Bay were supplied with a popular model of palmtop computer to use for a period of four weeks. This model, the Hewlett-Packard HP360LX, utilizes the Windows CE Version 2.0 operating system. Introductory instruction was provided to all project participants for the use of these computers in individual, network and meeting environments. Project data was compiled through two surveys; one which attained information flow and work flow data both prior to and following the study and the second which attained data regarding the preferences of the individual participants for using the HP360LX. Project methodology, implementation, performance indicators and data collection are discussed in Chapters III, A-D. Project data analysis and interpretation are specified in Chapter VI, A, while results regarding productivity and preferences in Chapters IV, B-C. Chapter V presents the project's benefits, accomplishments and limitations and recommendations for further research may be found in Chapter VI. Chapter VII contains several appendices. Appendix A is a Glossary of terms used throughout this paper. Actual project surveys are

included in Appendix B while survey Survey Analyses may be found in Appendix C. And finally, Chapter VIII contains all bibliographic references.

II. BACKGROUND

Science and technology multiply around us. To an increasing extent they dictate the languages in which we speak and think. Either we use those languages, or we remain mute.

-- Ballard, J. G., English novelist. Introduction, 1974, to the French edition of *Crash* (1973) courtesy Columbia University Press.
Copyright © 1993.

For this reason, Appendix A has been included. It is a glossary of terms used throughout this thesis.

A. DEFINITIONS

There are two simple definitions that must be clarified before a discussion of communication may occur. The terms "information" and "data" are often used interchangeably. In terms of information systems, the two are distinct elements of every process. The following definitions will be used throughout this discussion:

Data - raw vocal, numerical, written or observed facts about a specific topic.

Information - the product of processing and combining data to generate facts which may pertain to multiple topics (processed data).

Data is a raw, machine-friendly representation, while information is refined and human-friendly. Figure 2.1 is a graphical presentation of the relationship between these two terms.

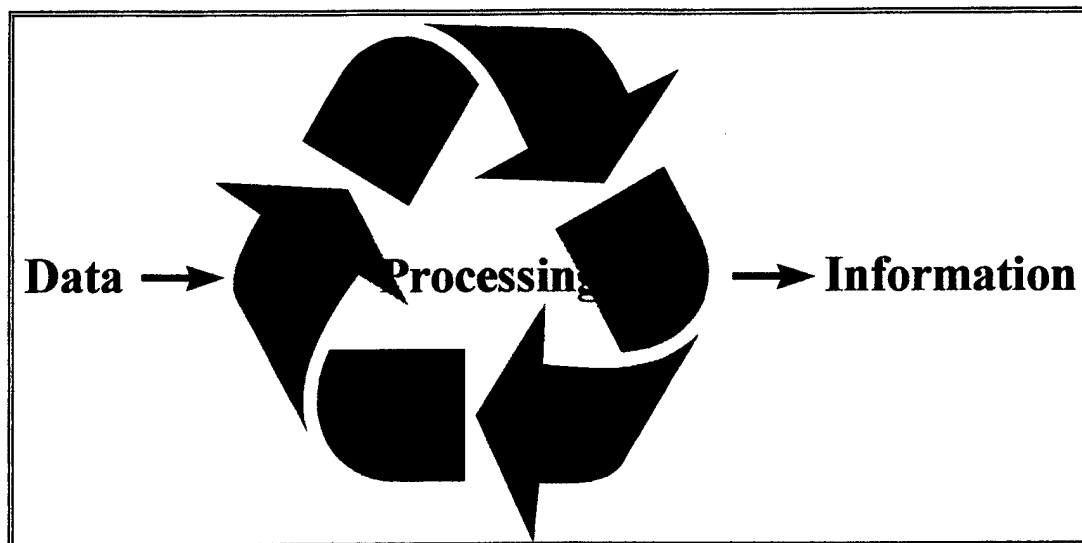


Figure 2.1: Relationship between Data and Information

Any discussion of information systems usually entails Data Flow processes which also require a few key definitions:

Collection - gathering data from all sources including the environment and other contributing factors.

Storage - retaining collected data in a location (physical and/or virtual) until needed for processing.

Retrieval - locating stored data and loading into memory for the purpose of processing and/or presentation.

Processing - manipulating data through calculations and/or filtering to abstract information.

Presentation - displaying data and abstracted information in a manner which facilitates comprehension and learning.

B. WORK AIDES

All professionals **MUST** communicate in order to attain information necessary to accomplish their jobs. They often utilize material objects to store such information. Communication is the underlying element in all professional activities, whether between people, from a resource (such as a book, newspaper or computer file) to an individual or from the individual to him/herself (reminder). Each individual has different preferences for how he/she goes about attaining, storing, processing and presenting information. These processes are depicted in the Basic Flow of Data diagram of Figure 2.2.

1. Personal Organizers

There are primarily two types of "day-timers" or personal organizers: paper-based and electronic. It is common practice for many professionals to use these devices to manage meetings, contacts and task scheduling information. The size of paper-based organizers and the way in which data is entered makes them useful because they are very portable and conducive to immediate data entry (collection) in most situations. Data

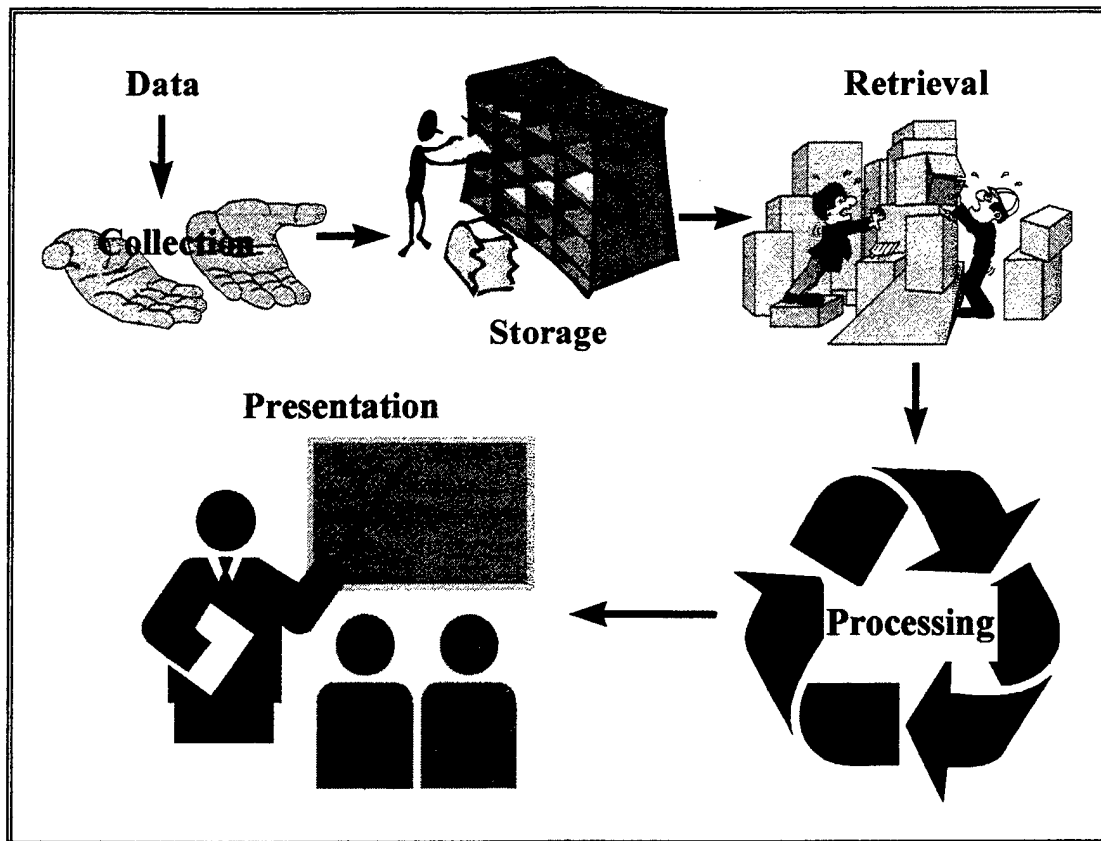


Figure 2.2: Basic Flow of Data

is entered by a handwriting instrument such as a pen or pencil or business cards may also be stored in the organizer. Important information may be accessed at all times since most people carry their organizer with them where ever they go. And, because they are segmented into different sections such as calendar, tasks, contacts, notepad, etc., data retrieval is quite convenient. They are, however, limited because they lack any type of processing capability and are not a functional means of presentation other than to the individual. Once data has been processed and the refined information is stored in this format, the original data is irretrievably lost. Group synchronization and coordination of schedules and activities is inconvenient because handwritten notes and schedules must be

personally compared. If this manually compiled information is transferred into a digital format, group scheduling and other processing are simplified while also enabling more appropriate methods of group presentation.

Electronic organizers are similar in the functions they provide but differ significantly in the manner in which data is entered and presented. These small battery powered devices have a miniature keyboard which allows the user to "hunt and peck" alpha-numeric keys to enter names, addresses, phone numbers and scheduling information in digital format. Like paper-based organizers, they do not simplify group scheduling, although some will allow the user to synchronize data with scheduling and contact programs on personal computers that may be linked to group scheduling applications.

2. Notepads

An extremely simple and reliable aide, the notepad or notebook, assists in storing collected data. Many professional Naval officers carry "wheel books" to record important data for later use. This raw data is usually processed by the individual or is fed into more sophisticated processing systems. The resulting information may then be recorded in the notepad. While data entry is simple and convenient, retrieval becomes difficult as more and more data is recorded. These devices also do not allow for effective group presentations nor do they provide any type of processing capability.

Paper-based organization devices are only as effective as the individual who enters the data. Organization of entries must be done by the user to facilitate all subsequent portions of the Basic Flow of Data. Automated organizers usually provide specific fields

for storing data, compartmentalized locations and allow the user to query data records to quickly locate specific entries.

3. Cellular Phones

The cellular phone is a very limited data organizer, but its primary role is as a mobile communications device. Most cellular phone users view their phone as a portable version of the device that all of the first world nations depend upon to maintain communication. The cellular phone's greatest value is its wireless connectivity that enables portable communications. Some cellular phone manufacturers have increased its utility by providing an additional data entry port which accepts data streams from a computer modem. With a mobile computer and a cellular phone, access to electronic mail (email), the Internet and corporate intranets is only a phone call away from any place on earth that lies within cellular coverage.

The increasing popularity of cellular phones has led to a huge growth in the telephone industry. Suddenly, new area codes were required to avoid exhaustion of available telephone numbers in regions throughout the nation. As cellular phones and services become more useful and affordable, this demand will continue to increase.

4. Pagers

Until recently, small telephone accessed pagers or "beepers" only provided one-way communication. Now, however, these devices are capable of sending as well as receiving brief messages. Although not a preferred communications medium, pagers fill a

vital role by affording mobile users direct access to information without having to take time to communicate with other people. The initial intent for pagers was to notify an individual who did not have access to a telephone or walkie-talkie radio of important or emergency situations. Because of their small size, simplicity of use and communications capabilities, the pager's popularity has blossomed to the extent that these tiny devices can be seen on the belts of a large number of professionals and family members. Today, it is common to see expecting fathers carrying pagers, and not because their job requires it.

5. Digital Personal Communication Systems (PCS)

Digital Personal Communication Systems (PCS) are the current trend for cellular phone users and manufacturers. These are a combination of products and services that provide the communication functions of the basic cellular phone along with two-way paging and a contact database which stores frequently called names and phone numbers. Although capable of regular telephone communication, the digital PCS, like a pager, affords the mobile professional the luxury of receiving timely information without having to interact with the sender of the information (asynchronous communications). This can be very valuable in situations where conversation may take place out of necessity rather than want. Many PCS providers include voice-mail as an optional service. PCS products that couple voice-mail with a paging service allow users to receive more lengthy voice messages in a timely manner. This is similar to having an answering machine that notifies its owner when it has recorded a message. PCS phones also have an auxiliary data port which can be connected to a portable computer to send and receive digital data.

C. ERGONOMICS

Size, weight, shape, appearance, capabilities and methods of entering data are all contributing factors to making any device useful. Together, these factors compose the design quality known as ergonomics. The field of ergonomics has become well known due to the role it has played in the worldwide auto industry. Through the 1980's car manufacturers were forced to produce automobiles that were fuel efficient, economical and stylish. Many American companies which had traditionally produced "muscle cars" with a large engine and a heavy chassis had a difficult time adapting to this new design paradigm. Japanese manufactures had spent years perfecting the economical design because their nation's markets had dictated such car styles. As American companies slowly adapted, the Japanese had an additional advantage. They also understood the value of making the inside of the vehicle as pleasing as the outside. Important engine gauges and controls were strategically placed closer to the driver allowing for a more comfortable and convenient driving atmosphere. The word "ergonomic" even became part of their advertising campaigns. It would seem that just knowing that this word existed, helped many American car buyers to better understand why they preferred the Japanese design over that of American car makers.

As with cars, work aides are only useful if they are appealing and convenient to use. The user interface is the primary means by which the user evaluates a device. Therefore, it is critical that it be appealing and simple. Many work-saving devices have been developed but are not popular because they are inconvenient or difficult to learn and

and use. In designing the user interface for the new Windows CE operating system, Microsoft's Robert O'Hara, the original development manager for the PalmPC comments:

Overall, the lesson we learned in designing the user interface for the PalmPC and AutoPC -- and the lesson that you have to keep relearning throughout your life -- is that making something simple is hard. The fewer pixels you have on a screen, the more precious each one becomes. And there's a very natural tendency to try to pack lots of information in. But you have to keep reminding yourself that some things don't necessarily belong on a smaller interface. (Jerney, p. 3)

D. CONVENIENT, TIMELY ENTRY OF DATA

Communication is also required with all devices that assist in accomplishing work. The actions that the user must take in order to communicate with the device must be simple and unimposing. Quite simply, devices which impede communication will not be used. A complex interface such as layers of menus that require the user to make specific choices often lead to impatient and dissatisfied users. As a result, the device gets placed in a drawer and is not utilized. There are four basic processes that must be made as simple as possible in order to develop a highly useable work assisting device:

Ready-to-use:

When the user wants to use the device, it should be ready immediately for data entry. Most personal computer users have become accustomed to waiting for their computer to "boot up." In most work-related situations where the professional needs to use a device, a delay is not acceptable. The only delay associated with using a pen and notepad is the time necessary to retrieve both items from where ever they are stored. This is very minimal and both the user and the information provider are usually

accommodating. On the other hand, if the user retrieves an electronic device that must warm up before it can be used, the user will have to alter his/her routine in order to better prepare for its use. This is a luxury that is not available in ad hoc environments such as chance meetings while walking down a hallway. Electronic work aides must be ready to use as the user has them in hand.

Data entry procedures:

The user must be able to communicate and enter data into the device in an unobtrusive manner which is familiar to the user. For example, the news reporter scribbling notes furiously into a notepad while listening and speaking to the interviewee. An even simpler solution is the pocket tape recorder which merely records the voices of the individuals. This tape recorder is preferred because it unobtrusively records the conversation and unlike the notepad, it records everything and not just the comments that the user decides to annotate.

Organization of information:

Once the data is entered into the device (stored), it must be organized in a fashion that is logical and familiar to the user. Paper-based organizers allow the user to organize by location - separate sections for scheduling information, addresses and notes. Organization is important for only one purpose - retrieval.

Information retrieval:

As with entering data into the device, retrieval of information must also be quick and uncomplicated. In this aspect, the notepad may be preferred to the tape recorder because the user may "earmark" specific pages to make locating them easier. The tape must be rewound or forwarded repeatedly until the desired information is found. Complex data storage techniques

often lead to the "shelving" of devices with very simple data entry methods. The mobile professional or the individuals with whom he/she communicates does not have the time nor patience to hunt through complicated menus of choices in order to retrieve pertinent information. Once the desired information has been located, it must be presented in a format that the user can readily comprehend without difficulty.

When combined in one device, all four qualities produce a product that is both useful and useable. However, these features are rarely viewed directly by the user. They are all encompassed by the complex concept of a user interface which usually presents graphical representations (icons) of both data and processes. The user interface goes far beyond just the viewing screen and may include the keyboard, mouse or pen, other "hot keys" or buttons, the layout and positioning of all these controls. The nature of the human's interaction with the machine is the motivation for producing an ergonomically pleasing device. However, because of its reliance upon human preferences which are often difficult to explain, ergonomics is extremely complicated and rarely perfected.

E. EVOLUTION OF PERSONAL COMPUTER TECHNOLOGY

Although the digital computers of today have their roots in the abacus dating back to the Chinese Tang dynasty (618-906), and early mechanical calculating devices, credit for the design of the first modern computer, the "analytical engine," is given to Charles Babbage in the 1830s. The first fire control computers for naval gunnery were developed in the early twentieth century. The first computers were actually machines with moving parts much like clocks, but the early electronic computers of the late 1930's and 1940's

were built of vacuum tubes consuming entire rooms and huge amounts of electricity. In 1939 John Atanasoff constructed the first electronic digital computing device. The first fully automatic calculator was the Mark I, or Automatic Sequence Controlled Calculator, which Howard Aiken developed in 1939 at Harvard. The first all-purpose electronic digital computer, ENIAC (Electronic Numerical Integrator And Calculator) was developed in 1946 at the University of Pennsylvania. In 1951, UNIVAC (UNIVersal Automatic Computer) became the first commercially available computer capable of handling both numeric and alphabetic data. The capabilities of these computers were quite limited to specific mathematical processes. Designed like telephone switchboards, patch panels allowed operators to manually reconfigure them for other purposes. These switchboards are a fine example of an ergonomically incorrect, unfriendly user interface!

By the late 1950s and early 1960s, first-generation computers were replaced by the transistorized second-generation machines that could perform a million operations per second. The transistor led the way to smaller, more powerful mainframes with significantly lower power requirements. These new supercomputers did, however, have very specific climate needs. Mainframes were often placed in climate controlled rooms to filter out dust and maintain specific operating temperatures and moisture content. They, in turn, were replaced by the third-generation integrated-circuit machines of the mid-1960s and 1970s. As well as becoming smaller, this new generation of computers became more durable and were able to be used in more standard environments such as business offices. Increasing capabilities and complexity caused computer purchasing and operation costs to remain high. Computers were a luxury that were only affordable to corporations and were rapidly becoming a necessity in order to compete in the world of big business.

Throughout the 1980s and early 1990s the development of the microprocessor spurred the evolution of increasingly smaller but powerful computers such as the personal computer. The introduction of the personal computer (PC) represented the potential for computers to become a part of every household and they provided the average citizen the ability to store, retrieve and manipulate data in ways they had not been able to previously. The desktop PC lead to the laptop which in turn lead to the personal digital assistant (PDA) or the palmtop computer. The palmtop is the culmination of the evolution of commercial computers and micro-electronics and is the subject of this research.

1. Increased capability, smaller size, lower cost

The trend of all technology is to provide more capability, in a smaller device that eventually costs less than previous versions. Manufacturers typically set high prices for their new products in order to recoup development costs. As technology progresses, the advent of more capable products devaluates previous models and causes their prices to fall, maintaining consumer buying activity until the technology is no longer useful. The continuous increase in capability enables users to increase their productivity by simplifying or automating existing tasks while developing new ones to gain a competitive edge. This relentless technological progression requires corporate and private consumers to keep pace in order maintain their competitive position. The name for this phenomenon is the "technology treadmill."

2. Obsolescence of computer technology

The previous section developed the concept of technological obsolescence. The motivation for consumers on the technology treadmill is to stay abreast of computer technology in order to stay competitive...in other words, to avoid becoming obsolete along with their aging equipment. It is the nature of technology to improve upon previous designs, thus making them obsolete. This obsolescence carries with it a considerable price for both the corporate and private consumer. Once consumers step on the treadmill, they cannot step off, so they must continually spend money to upgrade to newer technology. If they do not, they will lose their competitive position and die.

3. Classes of Personal Computers

The computer evolution previously presented notes the existence of several types of personal computers. Each of these PCs serves specific needs which are reflected in their designs.

Desktop PCs:

Direct descendants of larger minicomputers, these are the first generation of the personal computer. Desktop computers account for the majority of PC systems produced and purchased in the U.S. computer industry. PC technology is rooted in the desktop computer. It is the test bed for which most PC components and peripherals are developed and tested. As these new components are proven on the desktop, they are then miniaturized and adapted for use in the smaller, more portable classes of personal computers. The desktop PC has loose size constraints and the primary design

concern is consumer demand - if the consumer wants it and it can be built and sold for a profit, it will be produced for the desktop.

Laptop or Notebook PCs:

The next generation of personal computers was developed to allow for portable computing. These smaller personal computers are capable of running the same operating systems as desktops. Mobile professionals who are constantly away from their office (if they even have one) demand computers that can accompany them wherever their business may take them. As more and more less-mobile professionals and private citizens discovered the potential that portable computers afforded, the popularity of laptop computers increased and they began to proliferate throughout the economy. Development cycles of laptop computers lag that of desktops by approximately three to six months. This period of time is necessary in order to sufficiently minimize components to fit into the smaller laptop form factor.

Palmtop or Handheld PCs:

Laptop PCs just were not small and mobile enough! In response, the concept of the palmtop PC was born. About the size of a checkbook, these miniature personal computers are small enough to fit into a suit pocket, briefcase or purse. These tiny devices have few if any moving parts such as hard disk drives. They run especially adapted or proprietary operating systems which provide scaled-down functionality of contemporary PC operating systems. Models of palmtops vary greatly in size, functionality and capability. Input devices for these models of portable computers also vary. In general, they make use of keyboards and/or stylus pointing devices (pens). The value of these tiny computers lies in

their portability. Comfortable to carry and convenient to retrieve, the palmtop can accompany the professional in countless situations (meetings, travel, working lunches) and provide instant assistance with information related tasks.

Hybrids (Sublaptops/Subnotebooks):

Technological advancements have led to extremely miniaturized versions of laptops which are capable of running full-scale versions of current desktop operating systems. Peripherals are often sacrificed in order to meet size constraints. Subnotebooks typically have fewer built-in media drives and ports and provide low-end multimedia capabilities. However, they do provide connections for portable CD-ROM, Zip and floppy drives.

F. PC AND PALMTOP OPERATING SYSTEMS

A computer, whether a PC or mainframe, is only as effective as its operating system. As processors became faster, additional capabilities and layers of abstraction added to their complexity. This trend continues but the developers of today's major desktop operating systems were faced with difficult problems when consumers demanded similar performance from miniaturized platforms. Each developer has significant amounts of manpower, research, time and money invested in the full-scale operating systems around which they have built their organizations.

Operating systems, like the hardware they control, had to become less sophisticated in order to meet the memory and processing requirements of smaller

platforms. In order to minimize development cycles and costs, producers of operating systems have attempted to make use of existing products.

As personal computers became more affordable and their operating systems became more understandable, homeowners began buying IBM-based personal computers which led more software developers to start producing products for these types of computers. Growth in the home PC market also encouraged hardware manufacturers to begin production of components of these machines. Intel was one of the most significant early entries into the PC hardware realm. Being less of a bureaucracy, they were flexible and quick to introduce new products. Their innovative designs standardized the production of central processing units (CPUs). With this standardization came huge increases in the number of PC software developers which in turn increased the usefulness of personal computers. Decreases in hardware production costs and the large amount of software producers and their products are the true reason why over 40% of American households have at least one personal computer.

1. Windows 3.1/3.11

When Microsoft first developed Windows it was not really an operating system but more of a graphical user interface to make the PCs more understandable for the average user. The graphical representation of programs and data structures was first introduced by Apple in the mid 1980s. Microsoft continued to revise its Windows line adding more functionality, increasing the level of abstraction from the underlying DOS operating system and consequently, increasing the storage and memory requirements. In the early

1990s, as corporate networks increased in popularity, Windows 3.1 was the final version of the single computer “operating system.” Windows 3.11 or Windows for Workgroups added network capability making it a preferred user interface for businesses PCs.

The Windows line was the vehicle through which Bill Gates hoped to attain his vision of a PC in every home in America. Apple’s success with graphical user interfaces made their products very popular with primary education facilities but their refusal to license software developers to produce programs for the platform led to a minuscule pool of software titles from which users could choose. IBM’s version of the personal computer enjoyed greater success. Capable of running a variety of operating systems, the IBM-based PC had open standards for software development which caused substantial growth in the industry.

2. Windows NT

As client-server networks increased in popularity, replacing mainframe systems, mastery of network operating systems became a requirement for the Chief Information Officer. In this realm, Windows for Workgroups led the way for Microsoft’s network operating system known as Windows NT. Unlike its competition, NT had a more graphical user interface which facilitated both network management and client use. Windows NT became to network operating systems what Windows was to DOS by providing simplified user/administrator interaction with operating system functions.

Throughout the 1990s Windows NT underwent revisions which increased its communications capabilities and provided tools for network administration. Integrating

World Wide Web protocols and services with local area architectures and network systems such as Novell NetWare and Banyon Vines increased Windows NT's userbase. Continuous graphical user interface upgrades allow this complex network operating system to appear friendly and familiar to stand-alone users.

3. Windows 95

The follow-on to Windows 3.1/3.11 was Windows 95. This is the first Windows that is truly an operating system. Windows 95 does not rely on DOS running underneath to provide access to basic machine functions. Microsoft's vision of the future of PCs places them in networked environments. Windows 95 was developed with many of NT's network capabilities allowing it to be run on both stand-alone, as well as network PCs. Also included are Plug-n-Play features which provide automatic detection and configuration of components and peripherals. Many system configuration and monitoring tasks are accomplished by the operating system, allowing less computer-oriented individuals a less intimidating computer environment.

The most noticeable features of Windows 95 are its graphical user interface and multitasking capabilities. The "desktop" is the initial screen state that the user sees when no programs are running. The GUI allows for ready access to any program or data files by placing shortcuts on the desktop. Additionally, programs that are running may be minimized to clear the screen allowing access to the desktop or to other programs that are running simultaneously. Previous versions of Windows required the user to be more savvy of the operating environment to be able to navigate through program windows

which may overlap or completely cover one another. Program minimization places icons in the "Taskbar" at the bottom of the screen, accessible at all times while operating in the Windows environment. The new GUI approach made navigation between processes quick, convenient and simple for all users regardless of their experience with computers.

4. Windows CE

Microsoft's Windows CE operating system is an adaptation of Windows 95. The intent is to "create information once, then access it from anywhere." Many of the functions that 95 provides for PCs are available for handhelds with CE. The GUI was designed to make the user feel immediately familiar because it is nearly identical to Windows 95. The first version of CE was extremely limited in the functionality that it provided. Now in its second version of development, Windows CE has improved communications capabilities and allows for devices with color and larger displays and interfaces that are even more similar to Windows 95. Windows CE computers were not designed to be used solely as stand-alone information organizers. Multiple communications media including a serial cable connection, infrared port, Web access via telephone modem (built-in or PCMCIA) and PCMCIA Ethernet cards are available through which the handheld may exchange data with desktop computers, other Windows CE devices and printers.

Windows CE was not developed solely for use in handheld PCs. This operating system is meant to be portable to new personal computing product lines called the PalmPC and AutoPC and also to a multitude of household appliances, the first of which is the set-

top television tuner for the cable television giant, TCI. The final vision of Windows CE is an operating system that will power networked appliances throughout everyday life allowing for centralized control of the home environment. Its compatibility with desktop PCs will enable the "home server" concept in which the furnace and air conditioning system, the toaster, the VCR and television, the microwave and all other home electrical appliances is controlled by a server that is configured and operated by the homeowner via a simple to use display.

This research will focus upon the usability of currently available Windows CE devices by professional officers of the United States Navy and Marine Corps. Critical success factors for the use of Windows CE handheld PCs and ergonomic weaknesses in the current implementation of the graphical user interface and device design will be identified.

G. COMMUNICATIONS AND CONNECTIVITY

The ability of computing devices to communicate with others has become a significant factor in determining the success of such products. An example of this is the AM radio. It was quickly replaced in automobile dashboards by AM/FM stereos because these radios could receive more music and entertainment stations. The cellular phone is another such example. A cell phone that cannot effectively allow its user to "roam" between and among coverage regions is only useful to the user who does not travel very far with it. For that reason, cellular service providers standardized their protocols to allow for nation-wide roaming and then incorporated the standards for digital service as well.

Connectivity refers to the computing device's ability to communicate with a network of computers in order to share information. Connectivity not only implies an actual connection, physical or virtual, but also encompasses protocol (software/firmware) requirements so as to specify a common language for that communication. Often times, the physical connection of a machine to a network is the simplest part of the operation. The intricacies of complex network operating systems are usually simplified to basic underlying protocols. These protocols, such as TCP/IP allow computers of different kinds (Macintosh, Intel-based PCs, UNIX, etc.) to communicate. While protocols are a critical component of any computer network, this research concerns itself more with the method in which connections are made.

1. Telephone

The telephone has become the most popular man-made communications device throughout the world. Because of this popularity, it is a commonly found item throughout societies across the globe. This makes it a popular connection method for computer users to attain connectivity to networks. The majority of existing telephone systems are analog and provide bi-directional long distance communication capability.

a. Conventional, "Plain Old Telephone Service" (POTS)

"Plain Old Telephone Service" or POTS refers to telephone network connections found in homes, hotels and other businesses throughout the United States. These lines provide simple to use, conveniently located connection ports with standardized

connection hardware. The RJ-11 plastic coupling provides a strong physical connection between the telephone and the cord and also between the cord and the telephone jack. Analog signals are transmitted through twisted pair copper wiring to the local telephone company at which point long-haul transmission is provided by fiber optic lines or satellite channels.

POTS lines account for the large majority of computer modem connections to networks. These connections typically are provided by local Internet Service Providers (ISPs) or national Internet access firms such as America Online, CompuServe or the Microsoft Network. All of these organizations maintain large modem banks which provide remote access via telephone modems to connect to their network assets through remote access servers (RAS). Corporate intranets are networks that serve business organizations and usually provide RAS connections for mobile personnel or to allow employees access from home. While any stationary computer may achieve connectivity through a POTS line, the only option available to truly mobile and remote users may be to make use of RAS connections through cellular phones. In either case, maximum bandwidth is 33.6 Kbps outbound from the user and 53 Kbps inbound.

b. ISDN

ISDN is a completely digital network that can provide many data and telecommunications services. All data streams whether voice, computer data, audio or video are digitized for transmission over twisted pair copper wiring to the local telephone

company. As with POTS lines, long distance transmission occurs through fiber optic lines or through satellite channels. There are two types of ISDN service available:

(1) Basic Rate Interface (BRI) - is a digital communications line consisting of three independent channels: two B channels, each at 64 Kilobits per second, and one D channel at 16 Kilobits per second. The B channels are used for carrying the actual digital information and may be linked together to provide an aggregate 128 Kilobits per second data channel. The D channel is used to carry network signaling and supervisory information. Each of the two B channels is treated independently by the network, allowing for simultaneous voice and data, or data only, connections to different locations. With specialized hardware and software, multiple B channel connections can be aggregated to achieve file transfer rates of several Megabytes of data per minute or more.

(2) Primary Rate Interface (PRI) - The Primary Rate standard is a higher-level network service with a transmission rate of 1.544 Megabits per second, which is compatible with commonly used T1 digital lines. The Primary Rate is comprised of 23 B channels, each at 64 Kbps, and one 64 Kbps D channel for signaling. These B channels can interconnect with the Basic Rate Interface, or to any POTS line when carrying voice services.

Due to its higher prices, business organizations are the principle customers for ISDN services. ISDN requires special cabling and connection hardware other than the common RJ-11 jacks and connectors of POTS lines. There are also distinct modems for

use with ISDN lines. Where POTS modems convert the digital signals from the computer into analog, ISDN modems simply reformat the signals for transmission over the digital communication line.

c. Cellular Telephone

As mentioned previously in section II, B, 3, the cellular telephone affords the mobile computer user a popular solution to the connectivity problem. Cellular capable modems for laptops and other portable computing devices allow the modem to connect to a cellular phone which then transmits over microwave frequencies to the antennas of cellular service providers. From there, interfaces to conventional telephone services are available. Availability of cellular services is dependent upon coverage areas of the service providers, therefore, the cellular method of achieving connectivity may not be appropriate when operating in remote areas without cellular coverage.

2. Other Network Connection Methods

Although most home and remote computer users opt for network connectivity by telephone communications there are several methods available. Some require physical cable connections while others make use of transmitted electromagnetic energy. The most prevalent forms follow.

a. Ethernet

Ethernet is the most common of today's network cabling systems. Composed of twisted pair copper wires, Category 5 10-Base-T Ethernet cable affords better performance than its predecessor, 10-Base-2 coaxial cable, in the areas of transmission bandwidth, installation flexibility and connection hardware. For the network maintenance personnel, Ethernet is much easier to work with and provides simpler computers connections. Coaxial cable is more rigid and cannot be bent as much as twisted pair cable, making it more difficult to route through confined spaces. Coaxial couplers are bulkier than the RJ-45 modular plastic couplers used for Ethernet cable. Twisted pair Ethernet network cards are also less bulky and can be more easily integrated into portable computing devices where space is valued commodity.

b. Radio Frequency (RF)

Truly portable computing devices require truly portable communications media. This means transceivers providing wireless connections with network access points that can be easily carried and do not require bulky power supplies. RF networks have much in common with cellular telephone networks. For example, they both share the problems of coverage areas and interference. Remote portable computers can only attain connectivity in areas covered by RF transceivers and antennas. These networks are currently in the state of development that cellular networks were in their infancy. Coverage areas are limited to select major business cities and usually require proprietary equipment and software. Roaming between service providers is not much of a problem at

this time because there are so few networks and service providers! Approval of the IEEE 802.11 standard for wireless data communication is sure to remove this barrier.

Ranges and connectivity of RF network communications vary widely. Short-range (less than 100 feet) point-to-point connections allow access to individual desktop resources while long-range (about 40 miles) systems provide the coverage and services of a wide area network (WAN). In between is the most common implementation of wireless networks. Medium-range (less than a mile) RF transceivers forming a local area network (LAN) provide the mobile computer user connectivity via a bridge that connects the wireless transceiver to the wired network. As with cellular networks, the strategic placement of multiple RF transceivers form "cells." When placed in locations covering an area such as a business complex or educational campus, users are afforded seamless connectivity as they roam between cells. This wireless LAN may then be connected to other LANs forming a large-scale WAN.

Minimization of interference is inherent to most radio LANs which utilize spread-spectrum, frequency-hopping techniques. These networks also provide security measures; depending on the complexity of the frequency-hopping algorithm and optional encryption capabilities, external monitoring or eavesdropping may be extremely difficult if not impossible. Combined, these two factors greatly improve system availability.

The U.S. military typically operates in remote areas where commercial communications are not available, nor do they meet security requirements. Therefore, digital data networks for the battlefield and their secure communications systems must be highly portable, scaleable and flexible. As mentioned previously, suitable existing commercial systems are not available. However, they may be implemented using

commercial off the shelf (COTS) products. But the intricacies of this task are beyond the scope of this thesis.

c. Infrared

Infrared is the portion of the electromagnetic spectrum that lies between visible light and microwaves. As a communication media, it provides short-range (2-20 feet), variable-bandwidth connections for data transmission. The most common uses of infrared energy involve remote controls for household appliances such as televisions and VCRs. More recently, infrared has become more prevalent in portable computers as a means to connect to desktop PCs and as a channel providing connectivity to a small-scale LAN. Infrared communications are very portable, flexible and secure. Equipment is lightweight and compact which makes it appropriate for handheld PCs and laptops, but it is not a preferred method of communication due its low-bandwidth, although some implementations achieve throughputs nearing that of Ethernet (10Mbps). Because infrared energy dissipates rapidly, it does not travel far, making it difficult to intercept in order to eavesdrop on communications.

Many models of H/PCs and laptops incorporate infrared ports to be used for short transmissions of data, ideal for ad hoc network environments. In order to guarantee compatibility between devices, a standardized infrared transfer protocol called IrDA has been established.

d. Satellite

The most costly but most feasible communication alternative for remote field operations in extremely isolated areas involves the use of satellites. Low-Earth orbit (LEO) satellites may be operated by private commercial organizations or by the military. They are in orbit at approximately 500 miles above the Earth and may be either geostationary or geo-synchronous. Commercial systems provide two-way data and messaging communications either globally or regionally. They are extremely useful in the commercial transportation industry for tracking trucks and other assets. Satellite communications are even used to locate stolen personal automobiles.

The equipment necessary for satellite communications is expensive to produce, purchase, operate and maintain. Additionally, the power required to reach satellites 500 miles above the Earth's surface is substantial which translates into large, cumbersome power supplies that must be transported along with the communications gear when taken into the field. The general rule for communications equipment is that larger bandwidth means larger equipment. Space is always a limiting factor no matter what military platform the satellite equipment is to be placed upon. For Naval ships with large bandwidth requirements, the equipment is bulky and often times difficult to mount in the most effective locations since space is a luxury and any weight placed above the ship's center of gravity affects stability. More significantly, portable satellite equipment for ground forces is even more obtrusive. The battery packs are large, heavy and bulky and do not provide sustained power. Nonetheless, satellite communications may be the only alternative for independently operating reconnaissance forces without logistic and communication support.

3. Modems

The modem, or modulator-demodulator, is a component that enables digital computers to send and receive signals over communication channels. Different modems are used depending upon the type of communication media. As mentioned earlier, conventional (POTS) telephone lines transmit analog signals. ISDN telephone lines transmit digital signals. Cellular telephone and RF networks may be either digital or analog and therefore, may require modems that are capable of detecting the type of transmission media in order to allow the computer to properly and safely communicate over the channel. In general, the term modem refers to an analog telephone modem.

Today's modems for portable computers are extremely compact yet house many communication capabilities. The PCMCIA card completely restructured the manner in which portable devices achieved connectivity. Although originally developed as a means of increasing portable computer memory, these cards, approximately the size of a credit card but thicker, are highly portable and durable due to their lack of moving parts. The PCMCIA (or PC card) may be easily installed and removed from portable computers enabling multiple, flexible configurations. Many PC cards combine the functions of different communications adapters. These are known as "combo cards" and may allow for communication via telephone and Ethernet lines simultaneously. Although there are many other versions of PC cards, this thesis will focus on their use as a communications component, or specifically, as modems.

a. *Analog Modem*

Analog is an older technology that is less complex and used more throughout the world as a communications medium. It produces a more accurate representation of the original signal but cannot be precisely manipulated by a computer. The analog modem is the interface that converts the computer's digital data stream into analog signals for transmission over conventional telephone lines. Voice signals are analog in nature, meaning they are not confined to a finite set of ranges in pitch and volume. The analog phone line shares these characteristics to some extent. All pitches of a steadily increasing tone are transmitted unaltered. On the other hand, the computer, with its binary digital signals has instantaneous discrete levels of pitch while volume is usually constant. The digital-to-analog conversion accomplished by analog modems results in less signal information loss. Because analog signals cannot be manipulated by a computer, they cannot be enhanced or reproduced, only amplified. In the amplification process, not only is the signal amplified, but also any noise present.

b. *Digital Modem*

Digital signals produced by a computer are composed of samples whose duration (time) are uniform. Digital signals only have specific values and are incremented in discrete steps. When an analog signal is converted to digital, an instantaneous sample or slice is measured and that value assigned for the duration of the sample period. In this process, large quantities of signal information are lost if either the sampling increment or the sample period is too large. This loss of signal information results in errors. Increasing

the number of samples per unit time and/or decreasing the increment size produces a more accurate result.

When digital lines of communication are utilized, modems perform different functions. Previously, the use of modems with ISDN telephone lines was discussed. Since computers generate digital signals, these special purpose modems simply repackage the digital bit stream into a format appropriate for the digital transmission line. This results in higher bandwidths for digital channels. Digital communication channels make inline signal processing such as regeneration and encryption possible.

c. Radio (RF) Modem

Radio communication systems may be either analog or digital. Usually, RF systems are implemented to meet a specific need by utilizing one technology or the other. Digital radio links allow for inline encryption and frequency-hopping, which are critical elements of battlefield communications systems because they minimize the effectiveness of enemy jamming (intentionally generated interference) and interception (eavesdropping) efforts. Similarly, cellular telephone networks may be either digital or analog. However, because existing areas of coverage may use either digital or analog links, cellular phone manufactures may include both types of transceivers in their handsets, to provide maximum coverage and usability. Cellular links may also utilize the same frequency-hopping and encryption technologies to minimize environmental interference and prevent eavesdropping.

H. INTEROPERABILITY OF PALMTOP AND CONVENTIONAL PERSONAL COMPUTERS

The term "Handheld PC" is a misnomer because PC has come to imply a set of operating systems, software and interfaces that may be run on a computer system. Palmtop computers are not capable of running either PC software or operating systems. Therefore, the term "PC Companion" may be more appropriate. Unlike "Handheld PC," this name implies the importance of the conventional PC (laptop or desktop) in the usability of the pocket-sized computers. In other words, for most users, the palmtop will not replace the personal computer, but rather, augment it. This can only be accomplished if the two machines can communicate, sharing data to be utilized by processes for which each computer is more appropriate. Therefore, interoperability between the conventional PC and the palmtop is essential.

1. Windows NT Compatibility

IT-21 is the Navy's policy to ensure the procurement of interoperable computer systems for use into the twenty-first century. This initiative requires that all new computer assets be networkable via the Windows NT operating system and support the Microsoft Office suite of applications. Systems do not necessarily have to run NT, but they must be compatible with it. Therefore, in order to meet the requirements of IT-21, palmtop computers, meant to interact with Navy network computers, must support connections through Windows NT.

2. Reliable Communications Interfaces Between Palmtop and Desktop Computers

The conventional personal computer is the most common method for installing software on a palmtop computer. Furthermore, it is often preferable to use a personal computer for data entry because of its larger viewing screen and keyboard. However, the mobile professional usually needs calendar/scheduling and contact information at all times, including while away from the desktop PC. Additionally, the mobile computer user typically uses the palmtop to compile notes, send email, manage tasks and compile a wide variety of data. The palmtop is well suited for these tasks, but these items need to be transferred to the personal computer at one time or another. The interdependency of the two computers is apparent. In order to keep the two synchronized, a simple, convenient and reliable method of data exchange must be available to transfer files back and forth.

The original development manager for the PalmPC, Robert O'Hara describes the synchronization process for the Windows CE devices and also includes his vision for how this process will occur in the future:

Today, the operation of synchronizing with your desktop, for example, is still a somewhat cumbersome and overt action," says O'Hara. "We've made it as easy as possible by allowing you to set it in a cradle and it synchronizes automatically. But you still have to set it down. I can imagine that in a couple of years we could have a local area wireless network, radio frequency-based, where my device could remain in my briefcase and still synchronize with my desktop as long as it comes within a certain distance of the computer. (Jerney, p. 3)

I. PORTABILITY

The U.S. Naval forces are highly mobile and usually operate in demanding, remote locations. Unlike the term implies, professional Naval **officers**, live in a competitive, dynamic environment in which there exist enormous information requirements - although they often do have an office, they rarely occupy it in order to complete their duties. Accurate, timely information is crucial to decide appropriate actions no matter where the officer finds him or herself. The results of poor decisions may be catastrophic in times of war. However, this thesis is more concerned with the information requirements of Naval officers in shore-based activities and the methods they entail to manage their job-related tasks while mobile.

The most important factor in determining a device's portability is its size. For it to be a desirable piece of equipment to carry at all times, it must fit easily into a pocket or convenient carrying case. A second important design consideration is ruggedness or durability. A device that seems fragile will not be used by a mobile user. This means the shell must be able to withstand the inevitable scratches and bumps of everyday life on the go. Battery life is another quality that is necessary in a preferred electronic portable device. Not only must it function on battery power but it must do so for acceptable periods of time. The remaining factors, such as convenient data entry and simple graphical user interface which are inherent in effective portable computing devices have been thoroughly covered in the discussion of ergonomics in section II, C.

J. DURABILITY IN NAVAL ENVIRONMENT

Durability was briefly mentioned in the above section, however, considering the environment in which Naval officers exist, it is a topic worthy of more discussion. Not only are professional Naval officer mobile but they travel into a wide variety of conditions. For example, an aviator may be called upon to conduct an aviation mishap investigation in the wooded swamplands of Mississippi. A Civil Engineering Corps officer routinely inspects facilities on remote sites. Surface warfare and submarine warfare officers may be tasked with supervising the installation of new equipment while in dry dock. Marine Corps Infantrymen, Aviators or Communications officers frequently participate in field exercises in rugged terrain and extreme weather. The portable computing device must be designed to operate effectively in such conditions for prolonged periods of time. If it cannot, it will be left in a desk drawer with other items such as staplers and hole punchers that have been deemed inappropriate for use in the field.

The demands placed on mobile computing devices are high. But the demands placed on them by Naval officers are even higher. The palmtop computer is a device that may be considered relatively inexpensive, but it still is not a piece of equipment that can be readily replaced should it malfunction or become damaged. Each user configures each device to meet a specific set of needs. This configuration process may be time consuming and is not a task that many individuals will be willing to repeat while mobile. If the computer is not sufficiently durable, the officer will quickly forsake it and opt for less sophisticated but reliable means.

III. METHODOLOGY

A. OVERVIEW OF NAVAL POSTGRADUATE SCHOOL STAFF OFFICER PALMTOP COMPUTING PROJECT (NPS-SOPCP)

The palmtop computer is a new device in the world of portable computing. Because of this, there has been little research published in the area of usability and ergonomics, let alone specific studies of usage by military officers. For this reason the Naval Postgraduate School, Staff Officer Palmtop Computing Project (NPS-SOPCP) was conceived. The NPS-SOPCP was designed to provide data which answers two questions: 1) Can professional Naval officers benefit from the use of highly portable computers to assist with information management tasks? and 2) How well do current Windows CE devices suit these tasks? In order to produce data on this subject, actual Naval officers have to be observed using such devices in their daily job routines. The NPS-SOPCP is the vehicle developed for this purpose.

B. NPS-SOPCP PROBLEM STATEMENT AND OBJECTIVES

The NPS-SOPCP was a research project designed to compile data describing the effects that portable computers have on the information management processes of professional Naval officers. The NPS-SOP was designed so as to attain data describing the "before" and "after" states of Naval officers' information processing methods. The "before" state refers to the way in which tasks are accomplished without a palmtop computer. The "after" state refers to the role which the palmtop plays in assisting with

task completion. Collecting data in this manner allows for a comparison between digital (palmtop) and analog (paper-based) methods.

C. NPS-SOPCP DATA COLLECTION

The collection of data describing the usage of palmtop computers by professional Naval officers was the sole purpose of the NPS-SOPCP. Therefore, data must be timely and accurate. Two methods of data collection were utilized in this research project.

1. Project Surveys

Survey questions were phrased so as to attain specific data in a number of areas including communications, computer skills, technical proficiency and general information and task organization. Initial surveys were used to compile data describing the "before" state of information processes while subsequent administration of surveys provided data describing the "after" state. Additional data was attained through personal discussions at group meetings.

a. NPS-SOPCP Survey

The Naval Postgraduate School, Staff Officer Palmtop Computer Project Survey was the first survey to be administered and was designed to provide the baseline data describing the participant's approach to information management and organization and was also used to evaluate technical proficiency. The NPS-SOPCPC Survey was administered initially before exposure to the palmtop computer, then a second time at the

end of the four week project. Participants were able to compare the ways in which they attained, stored, processed, retrieved and presented information prior to and after using the palmtop computer. This was the longest of the two surveys and demanded the most time on the part of the subjects.

The survey was oriented toward the value that the participant places on types of information and to determine how information is managed and processed. It was intentionally vague in mentioning specific palmtop computer applications or technologies in order to encourage the participant to be descriptive, yet use his/her own words to describe the process and not the tools.

After using the palmtop for a four week period, participants complete the survey a second time. Their initial responses were readily available so they could, themselves, make comparisons and determine how they may have changed their information management tasks by using the palmtop. Appendix B, Part I includes the participants' actual NPS-SOPCP Surveys.

b. Palmtop Technology Survey

The Palmtop Technology Survey was designed to attain data regarding the specific palmtop computing device (HP360LX) that the participants use. It was administered initially at the end of Week 2 of the study and again at the completion of the project at Week 4. Comparison of iterations of the surveys enabled an analysis of the learning curve for each subject. The participants' actual Palmtop Technology Surveys are included as Appendix B, Part II.

c. Survey Analyses

The two project surveys have been analyzed manually and with the assistance of a spreadsheet. Both survey analyses are found in Appendix C. Part I of the appendix is the analysis of the NPS-SOPCP Survey while Part II is the analysis of the Palmtop Technology Survey. Each analysis is composed of a Survey Summary and the digitized versions of each subject's survey forms from Appendix B. Survey Summaries provide general trend information and compilations of responses by all five participants. The survey analyses begin with sample sections describing the pages of the spreadsheet and any calculations that are performed to yield quantitative values. Included are combinations of questions that have been designed to derive additional information describing the subject's preference for using technological solutions to assist with manual tasks and specific information regarding the HP 360LX. The NPS-SOPCP Survey Analysis has an additional component called the Correlation Analysis which details the procedures and results of combining specific survey questions.

2. Participant Interviews

The second method of data collection utilized by the NPS-SOPCP involves structured and unstructured vocal interactions between the project administrators and participants. During project meetings and other interactions, data received regarding device preferences and information management procedures were annotated for use later. These notes were used to evaluate the performance indicators listed below in Section D.

3. Participant Journals

Electronic project journals are text files stored on the device. Participants were encouraged to record comments regarding the product and the way in which they must interact with it in these files. Participants were free to use whatever methods they preferred, however, the selection of a non-device-based method may indicate either a preference to not use the palmtop for this purpose because of inconvenient data entry or a reliance on more conventional methods of recording data. This second approach contributes to the participant's technological proficiency.

4. Subjective Evaluation

Personal discussions with each participant were used to analyze their willingness to use a palmtop to assist with tasks. Observations and discussions were used to determine the individual's technical proficiency. These assessments were subjective because responses were difficult to quantify and, therefore, could not be evaluated quantitatively. In doing so, the author relied on previous experience as a counselor to interpret verbal and non-verbal responses as objectively as possible. However, **complete** objectivity is not possible in human interactions.

D. NPS-SOPCP PERFORMANCE INDICATORS

The project cannot produce accurate, reliable data unless fundamental performance indicators were defined. The effective implementation and use of a technological device in

a human's daily life depends primarily on the individual, as well as the specific device. In order to evaluate the "before" and "after" states of each participant, three interrelated indicators were formulated.

1. Technological Proficiency

Since humans typically "fear that which they do not understand," proficiency strongly implies an **understanding** of the topic, in this case, technology. **Efficiency** is also implicit in proficiency. To be proficient, the individual must not only have an understanding of the topic, but also must be able to anticipate possible results of actions and respond efficiently. The final component of proficiency is of a physical nature. The proficiency that an individual develops in using a device is directly related to the **convenience** in which the device affords interaction. This is an ergonomic design issue. Technological Proficiency is a significant factor in accurately determining the two remaining performance indicators.

2. Device Preference

For this study, the term "Device Preference" is used as a measurement of the subject's willingness to employ an electronic device to assist with routine personal and job-related information management tasks. The actual measurement of this quality will be described in Chapter IV. An individual's willingness to use, or receptivity of a device is reflective of that individual's proficiency and the device's design. A simple interface along with other ergonomic factors discussed in the previous chapter directly effect the

participant's willingness to use the palmtop device since a complex system of interactions is often difficult to understand. Size and weight are major factors in determining receptivity to use. A heavy, burdensome device will not be used because it is not convenient. On the other hand, users are much more willing to use a small, unobtrusive device.

3. Device Proficiency

For the purpose of this study, the term "Device Proficiency" describes an individual's familiarity with technological computing and communications devices and the ability to learn how to use them to assist with tasks. The actual measurement of this quality will be described in Chapter IV. The proficiency that the participant develops by using the palmtop will be limited by the ergonomic design issues mentioned previously and by the individual's willingness to expend effort to make the device work for him or her. This assumes that the device is not inherently friendly and requires user interaction to accomplish tasks. This seems to be a safe assumption since most machines do not physically or logically function like the human operating them. A device which is not too difficult to learn how to use encourages the user to use it more. In so doing, the user becomes more adept and eventually masters the device. This is what is meant by proficiency with the palmtop.

E. PROJECT PLANNING

The NPS-SOPCP was a four week project composed of events which must occur at specific times. These events included introduction and training sessions, palmtop issuance, administration of surveys and group meetings.

1. Officer Selection

Project participants were selected from all active duty United States Navy and Marine Corps officers at the Naval Postgraduate School who were not in billets directly involving education. Officers in positions which were common at shore facilities were preferred. The study group was composed of both male and female officers with a mixture of senior and junior personnel ranging from paygrades O-3 through O-5. Participants were selected because they had varying degrees of familiarity with computers and technical knowledge. Varying job responsibilities and information requirements allowed for collection of a spectrum of data and individual preferences. Table 3.1 is an anonymous listing of the officers participating in the NPS-SOPCPC.

Table 3.1: NPS-SOPCP Participants

SUBJECT	SERVICE	RANK	TITLE	SEX
1	USN	CDR (O-5)	Executive Officer	F
2	USMC	LtCol (O-5)	Marine Representative	M
3	USN	LCDR (O-4)	Asst. Programs Officer	F
4	USN	LT (O-3)	Material Div. Supply Officer	M
5	USN	LT (O-3)	Asst. Public Works Officer	M

2. Project Equipment

A popular model of handheld computer was used in this study. All of these devices had to be "as-is" commercial-off-the-shelf (COTS) units that were interoperable with IT-21 Naval computer assets. Six Hewlett-Packard 360LX palmtop computers were procured because they included many of the typical functions and programs common to Windows CE version 2.0 devices and they were designed to communicate with Windows 95 and Windows NT systems. Figure 3.1 contains Hewlett-Packard 360LX specifications.


	<p>The Hewlett-Packard 360 LX is a first generation, pen-based, Windows CE handheld computer that runs the Windows CE 2.0 operating system. The units used in this study have the following specifications:</p>
<p>Processor - 60 MHz, Hitachi SH3 ROM - 10 MB Serial Communications Port PCMCIA Slot Power - 2 AA Rechargeable Batteries Microsoft Pocket Word, Excel, PowerPoint and Internet Explorer</p>	<p>Display - 16 Level Grayscale RAM - 8 MB Docking Cradle for Synchronization Infrared Communications Port AC Power Adapter Flash Memory Card Slot Microsoft Pocket Outlook: Calendar, Contacts, Tasks, Email</p>

Figure 3.1: Hewlett-Packard 360LX Specifications

Since the palmtop's complete effectiveness cannot be achieved if operated as a stand-alone computer, each device was equipped with a docking cradle to connect with

the desktop or laptop computer and to recharge batteries. One PCMCIA telephone modem was also supplied. This modem makes remote access to email and web browsing possible. Project participants were encouraged to try their own PCMCIA modems with the palmtops. Although not procured by military means, other PCMCIA cards were utilized. A LAN modem combo card was used to test Ethernet connectivity and a VGA adapter card tested group presentation capabilities.

The final pieces of hardware are provided by the project participants. Their desktop or laptop PCs either at work or at home were to be used to synchronize data and provide the ability to download additional applications. Other equipment used for the project included existing local area network (LAN) assets including remote access servers. LAN administrators played critical roles in resolving network access problems, as well as attaining necessary UNIX accounts.

F. IMPLEMENTATION OF NPS-SOPCP

Having completed the planning stage, the project was executed accordingly. Once a baseline evaluation of each project participant was completed, palmtop computers were issued. Introductory information and training was provided but specific tasks other than those for which the palmtop manufacturer has included software applications was not suggested. Since the initial use of palmtop computers by officers in the military will be by individuals who purchase the devices with their own funds, participants were strongly encouraged to utilize the palmtops for all tasks, personal, as well as job-related. This also promoted the use of devices in all aspects of daily life. This realistic use of the devices

provided a more accurate assessment of the product's ergonomics and usability while promoting the development of proficiency.

a. Initial Administration of NPS-SOPCP Survey

Once the Naval officers had been selected, each participant was asked to complete the NPS-SOPCP Survey describing methods of information management in the "before" state. These surveys were quite lengthy and adequate time to complete them was provided. To ensure the collection of accurate data, clarification of questions was strongly encouraged.

b. Initial Training

The initial meeting with all participants was meant to promulgate project and equipment information and demonstrate the use of the palmtop. Only the HP360LX's basic functions were explained and demonstrated to allow the users to experiment and find additional applications. This process also allowed for evaluation of each participant's learning curve. Following the initial meeting, assistance was rendered upon request to connect the participants' palmtop and desktop computers.

c. Recommended Tasks

The Hewlett-Packard device comes with numerous applications built-in. These applications include calendar, task and contact management capabilities as well as email, word processing, spreadsheet and presentation software.

d. Uses for Palmtops

Specific communications capabilities were demonstrated and all subjects participated in an exercise in the infrared transmission of data files. Operation of a PCMCIA card, battery recharging and desktop synchronization procedures were explained. Add-on handwriting recognition software has been included as a data entry option.

e. Journal: On-Going Comments of the Palmtop

As stated above in section C, 3, participants were specifically advised to maintain an on-going text file of product "likes and dislikes" and project comments and observations. These real-time notes would help with more accurate responses to post-project survey questions and encourage the participants to use the device regularly.

f. Mid-Project Review Meeting

After two weeks of using the palmtop computer in their daily routines, a mid-project meeting was conducted. In this meeting, subjects presented information regarding their usage of the palmtops. Data in the form of files and personal contacts were shared and transmitted via infrared and network email communications. Questions regarding difficulties were discussed, documented and, if possible, resolved. A thorough

discussion of product likes and dislikes allowed participants to identify and convey shortcomings in product capabilities and project expectations.

g. Initial Administration of the Palmtop Technology Survey

Having used the palmtop for two weeks, participants may then render an assessment of the product and its functionality. Participants' initial preferences were easily determined from the Palmtop Technology Survey responses.

h. Final Project Meeting and Debrief

The final two weeks allowed the participants further familiarization with the HP360LX in which they could also use the devices in ways presented by other participants at the mid-project meeting. Following the second two week period, a final meeting occurred in which participants stated overall opinions of the device and the project.

Project administrators (the thesis author and advisor) provided their observations and supplied additional topics for discussion in order to promote individual and group participation in a dialog regarding the use of technology and information processes in everyday life. Thorough discussion of device ergonomics occurred providing insight into design problems inherent to this rendition of the palmtop computer.

i. Final Administration of NPS-SOPCP Survey and Palmtop Technology Survey

Both surveys were redistributed to participants for final responses. “Before” and “After” states were thoroughly described following completion of these surveys. Collection of the surveys officially completed the Naval Postgraduate School Staff Officer Palmtop Computer Project.

IV. FINDINGS

A. SURVEY DATA INTERPRETATION

Data from the two surveys utilized in the Naval Postgraduate School Staff Officer Palmtop Computer Project was interpreted and analyzed to produce information regarding the use of palmtop computers by Naval officers, their information management needs, and their preferences for a device to assist with such tasks. Appendix C, Part I is the analysis of the NPS-SOPCP Survey and the analysis of the Palmtop Technology Survey follows as Appendix C, Part II. Table 4.1 anonymously lists the officers participating in the study and provides brief background information.

Table 4.1: NPS-SOPCP Participants

Subject	Rank	Service	Title	Sex
1	CDR (O-5)	USN	Executive Officer	F
2	LtCol (O-5)	USMC	Marine Representative	M
3	LCDR (O-4)	USN	Assistant Programs Officer	F
4	LT (O-3)	USN	Material Division, Supply Officer	M
5	LT (O-3)	USN	Assistant Public Works Officer	M

1. Analysis of the NPS-SOPCP Survey

Each subject was evaluated on two aspects pertaining to electronic computing devices. These aspects are referred to as: "Device Preference" and "Device Proficiency." Device Preference is defined as the subject's preference to use an electronic computing device to automate or assist with routine tasks (preference for a specific device was not a factor). Device Preference is binary, either the individual prefers to use or does not prefer to use technological devices. Device Proficiency is defined as the subject's ability to effectively utilize such a computing device to automate or assist with routine tasks.

Device Proficiency is a subjective trait which was measured according to the rating scale presented in Table 4.2. This scale was used to quantify responses throughout the NPS-SOPCP Survey to assign numerical values to devices and applications to determine the participant's Device Proficiency. Higher values indicate more complicated mobile technology while lower values indicate simpler devices or applications that are typically common in everyday life.

A summary of the results of the NPS-SOPCP Survey is found in Table 4.3 and presented graphically in Figure 4.1. Actual surveys completed by project participants are Part I of Appendix B. The survey was implemented prior to issuing palmtop computers to subjects and then again after the four week trial period. For this reason, there were separate areas for "Pre" and "Post" responses. The comparison of responses to identical questions answered before and after palmtop utilization allowed for the determination of whether using the device may have 1) prompted the subject to adapt his/her work routine to the device, 2) prompted the subject to configure the device to adapt it to his/her work routine, and/or 3) prompted the subject to adopt a new approach to tasks and information management. Detailed notes regarding the interpretation and any functions or calculations performed by the spreadsheet may be found in the text boxes on the Survey Summary, Correlation Analysis and Sample Subject spreadsheets of Appendix C, Part I. Analytical comments regarding the information provided by each question are in color coded text to correspond with the appropriate response data on the Correlation Analysis Sheet.

Table 4.2: NPS-SOPCP Survey Rating Scale

VALUE	Description	Example Devices	Example Applications
1	Basic on-off operation, no other user interaction, no special skill or knowledge required.	Household appliances, camera, toaster, blender, pocket tape recorder, Post-It notes, note pad, etc.	Note-taking, sketching, writing a list, etc. (This category does not contain software applications).
2	Simple interaction or interface very limited skill or knowledge required.	Household appliances, phone, television, calendar, pager, fax machine, etc.	Word processor, email, calendar, address book, voicemail, etc.
3	Limited user input, interface requires user to be somewhat familiar and knowledgeable.	VCR, cellular phone, digital camera, date-timer, electronic organizer, etc.	Web browser, personal finance software, personal information manager (PIM), etc.
4	Extensive user interaction with complex interface, significant user knowledge required.	Desktop computer, scientific calculator, etc.	Presentation software, spreadsheet, etc.
5	Same as 4 but involves portability and mobility and possibly remote/wireless capabilities.	Portable computer, laptop, palmtop, PDA, etc.	Database, network management, video teleconferencing, etc.

2. Analysis of the Palmtop Technology Survey

The second survey, Palmtop Technology Survey (Appendix B, Part II) was used to evaluate the subject's actual usage of the HP 360LX. This survey allowed participants to list their likes and dislikes of the palmtop, describe shortcomings, better define their preferences for a palmtop computing device and clarify the impact it had on their work and personal routines. The analysis of the Palmtop Technology Survey is Part II of Appendix C. As with the NPS-SOPCP Survey, detailed notes regarding the interpretation and any functions or calculations performed by the spreadsheet may be found in the text

boxes on the Sample Summary, and Sample Subject spreadsheets. Comments regarding the analysis of response data are in other text boxes on the Survey Summary sheet.

The comments from the two analyses discussed above were used extensively in stating the findings of this research. In the following sections references to specific survey responses and their analyses shall be made in the format (C, II, 9) meaning Appendix C, Part II, Question #9.

Table 4.3: NPS-SOPCP Survey Results

Subject	Device Preference		Post-Pre	Device Proficiency		Post-Pre
	(Pre)	(Post)	Delta	(Pre)	(Post)	Delta
1	34	39	5	88.60	114.60	26.00
2	41	44	3	103.50	112.50	9.00
3	36	36	0	99.50	99.50	0.00
4	48	55	7	120.20	143.28	23.09
5	35	40	5	93.17	108.50	15.33
Mean	38.80	42.80	4	100.99	115.67	14.68
Range	14	19	7	31.60	43.78	26.00
Median	36.00	40.00	5	99.50	112.50	15.33
Mode	N/A	N/A	5	N/A	N/A	N/A
Standard Deviation	5.81	7.40	2.65	12.17	16.48	10.57
Variance	26.96	43.76	5.60	118.43	217.32	89.41

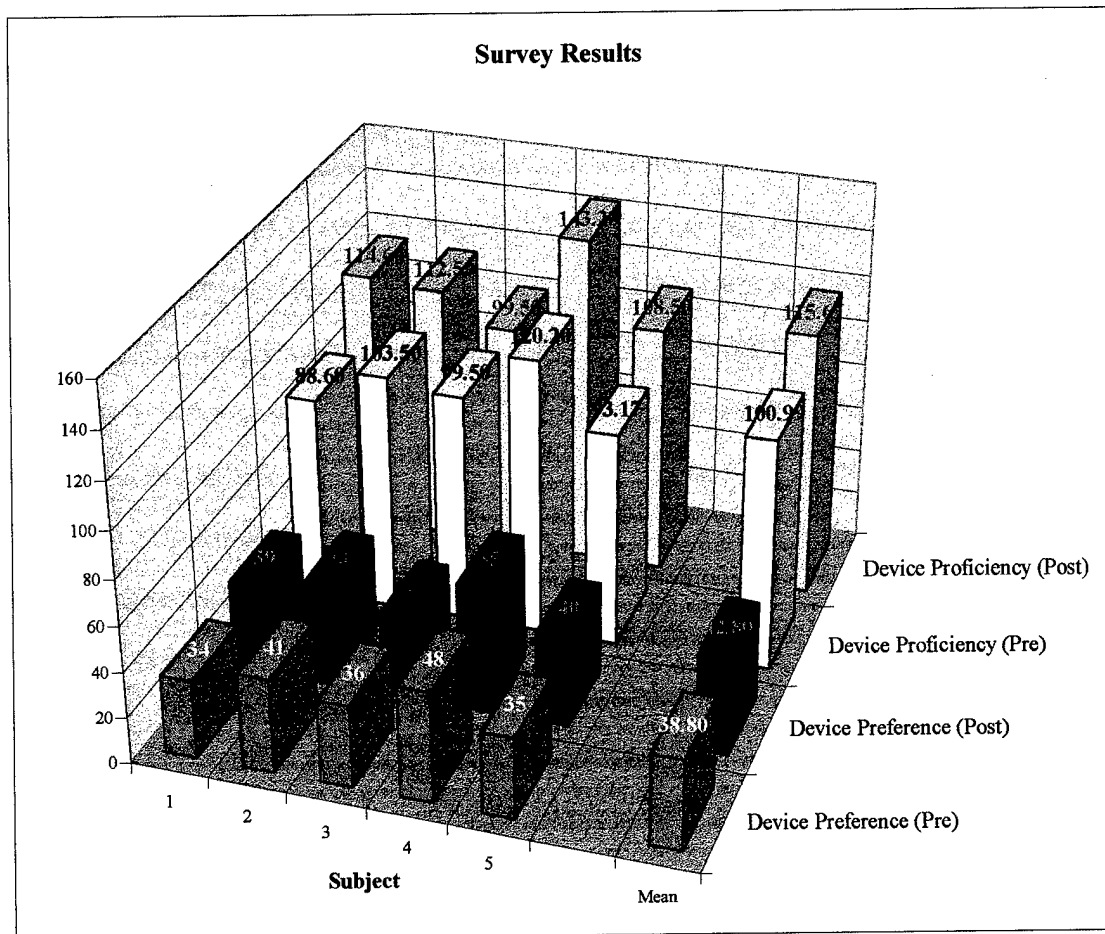


Figure 4.1: NPS-SOPCP Survey Results

B. DATA INTERPRETATION AND MEASUREMENT BIAS

The measurement and quantification of data greatly impacts the interpretation of results. Because of this fact, it is important to be aware of the underlying premises that the author has in interpreting and analyzing survey data. For several questions, the two parameters measured, Device Preference and Device Proficiency, are left to subjective evaluation for the assignment of quantifying values. While the methods documented in Table 4.1 were uniformly applied to all responses, there exists an inherent bias. The emphasis of this research is on portable computing, therefore, the highest score is only assigned to tasks, applications and devices that are mobile in nature. Therefore, it should

be expected that the values of Device Proficiency measured at the conclusion of the study are higher than those measured at the beginning. This parameter is still an effective measurement because it indicates the extent to which the subject utilizes the palmtop and its capabilities.

C. BACKGROUND OF PROJECT PARTICIPANTS

Many of the questions on the NPS-SOPCP Survey are intended to determine the participants' familiarity with and knowledge of computers. For example, all five participants have used word processing programs, spreadsheets, databases, scheduling applications and email (C, I, 22). Sixty percent of participants consider themselves to be "Knowledgeable" of computers and the remaining 40% consider themselves "Somewhat Knowledgeable" (C, I, 23). With regards to computer proficiency, 40% evaluate themselves as "Somewhat Proficient," 40% as "Proficient" and 20% as "Very Proficient" (C, I, 24). And finally, 20% of participants feel "Somewhat Comfortable" with computers, 40% feel "Comfortable" and the remaining 40% are "Very Comfortable" (C, I, 25).

The desktop computer was noted by all five participants before and four after, as being one of the three most important items on their desks. The second most noted item was the telephone. Initially, two subjects indicated the calendar as one of the three most important items. After the study, the calendar was noted by three participants. Only two subjects listed the palmtop as one of these important devices at the completion of the study (C, II, 7). All participants routinely used their desktop computers and fax machines

in their jobs. Personally, all subjects owned a film-based camera and four out of five owned a personal computer. One participant owned both a desktop and a laptop computer (C, I, 15). These and additional factors combined to establish the numerical values of Device Proficiency listed in Table 4.3 and presented in Figure 4.1.

In summary, all participants owned at least one computer and were experienced and comfortable, using them regularly. Since most participants owned and used similar devices, their Device Preference and Device Proficiency scores were also similar.

D. PALMTOP USABILITY AND PRODUCTIVITY

The principle reason for the existence of the palmtop computer is to improve productivity. An ultra-portable computing device should allow its user to collect, store, retrieve, process and present data and information while away from traditional computing resources. Measuring the degree to which a handheld computer improves productivity is a difficult process because of the existence of numerous random variables. As described previously in Chapter III, the NPS-SOPCP attempts to minimize the number of technical random variables by providing a standard platform for all participants. Additionally, each HP 360LX was configured with identical software applications. Therefore, the main source of random variability was the individual participant.

A review of survey comments quickly revealed that the palmtop computers utilized in this study did not provide a significant improvement in productivity. Although all participants who connected the palmtop to their desktop PCs were satisfied with the synchronization process and three out of five participants believed that all Naval officers

could benefit from using a palmtop, four of the five participants do not believe that the palmtop increased their productivity (C, II, 9). Subject #1 was the only one to specify why this was so. Her reasons were both software and ergonomically-based. The use of an incompatible scheduling application on her desktop PC caused her to have to enter data twice, while in her routine interactions with others, she felt using the device for taking notes was impersonal and inappropriate. Similar questions regarding simplification of job tasks (C, II, 11) and time savings (C, II, 12) yielded the same results, most participants believed the device was not effective. Subject #4 states, "The PDA does work out great for meetings, but its layout is cumbersome" (C, II, 11) then specifies how the device was helpful, "It saves me the hassle of retyping notes for distribution" (C, II, 12).

The Naval officers participating in this study selected daily schedules and email as the first items of information looked at upon arriving at work (C, I, 1). The participants unanimously selected email as one of the three most important work-related tasks (C, I, 2). At the beginning of the study, email was most often ranked first as important work-related information. At the end of the study, daily schedules became the item most often ranked first. Daily schedules also had the greatest increase in priority. Initially, daily schedules were ranked first by 20% of participants, after the four week study, this rose to 60% (C, I, 3). Four out of five selected email as the most important means of communication at work, the other subject ranked it as the second most important (C, I, 12). Ironically, after two weeks of use, only two participants listed it as a function they used regularly on the palmtop and only one continued using it by the end of the study (C, II, 10). Explanations given by participants at the Mid-Project Review cited a work routine in which email was a sort of **ritual** conducted first thing every morning while sitting in front of their desktop

PCs, not necessarily because the application was inconvenient to use. None of the participants used the device while traveling on temporary duty though, so this may be a situation where they would utilize the palmtop's email capability more. Another explanation resulting from the Mid-Project review was that "the palmtop's email program is like an eye chart due to the size of the unit's display! And powering the modem really shortens the battery life."

Although only three participants use email in their personal activities, email and task lists were initially, most often ranked first as the forms of information that they needed immediate access to throughout the day. By the end of the study daily schedules again rose to first place (C, I, 4). Because most palmtop owners use them to integrate both work and personal tasks, participants were encouraged to do the same. However, only two subjects actually integrated both work and personal tasks - neither of them used the palmtop to do so. Subject #2 integrated two-thirds of his work and personal tasks, including his calendar, day-timer, task lists and reminders (Post-It notes) on paper-based devices. Subject #5 initially integrated 20% of his tasks then finished the study by integrating 40%, all using paper-based devices (C, I, 3,4 and 5).

Overall, each subject organized his/her work and personal information to approximately the same extent, but subjects #1 and 2 were marginally more organized in their work-related tasks (C, I, 3, 4 and 5). Most participants organize their work and personal files "by topic" (C, II, 8 and 10). At the beginning of the study, most participants organized their files "a couple of times per week" and they generally, organized their files more frequently following the study (C, II, 9 and 11).

In general, the palmtops utilized in this study did not significantly improve productivity due to ergonomic design issues. While all participants were similar in their organizational habits, listing email as an important means of communication, they preferred not to use the palmtop for this purpose.

E. OFFICERS' PREFERENCES

The surveys and meetings provide an excellent forum for participating officers to voice their preferences and recommendations for palmtop computing devices. Additionally, Question #19 of the NPS-SOPCP Survey was designed to capture the specifications that these five Naval officers produced for an ideal mobile computing device.

1. Palmtop model

According to the project participants, if a device that meets their needs could be used by entire command, organizational efficiency could be significantly improved. Subject #5 states "Personal contact and interaction is still vital in an effective organization but use would improve routine correspondence, scheduling of meetings and transfer of information" (C, I, 20). Preparation time for meetings would be significantly reduced. Meetings would begin and end on time as a result of the scheduling applications. Information needed for meetings could be retrieved on the spot and shared with others without having to carry around cumbersome paper. The following is a description of the "ideal portable computing device" as compiled from participants' responses to survey questions (C, I, 19):

- It should be pocket-size and offer data entry by voice, handwriting recognition and/or a keyboard.
- The palmtop should allow for scheduling appointments (with an alarm), task lists, an address book, a note-taking application (not a word processor utilizing handwriting recognition but allowing electronic ink notes that can later be organized and converted to text if so desired), a separate word processor application, a basic calculator, spreadsheet and database functions, graphical image display, email and Internet access and file transfer and printing capabilities.
- It would be able to connect to other devices via direct cable connection, infrared link, built-in cellular modem and/or regular telephone modem. These connections would enable synchronization with a host PC and file access and transfer to other PCs and remote devices.

2. Compromises between portability (size) and capability

Participants were generally dissatisfied with the size of the HP 360LX. Initially, three participants stated the size discouraged them from using the device, while the remaining two were indifferent to its size. Following the study, only one subject remained indifferent to its size while the remaining four noted it as a use-discouraging factor (C, II, 2). During the Mid-Project Review several participants stated that the device actually attempted to provide "too many capabilities but only did a marginal job at them." Subject #3 stated, "For a portable device, efficiency and speed are more important than functionality. The functionality of a desktop or laptop P.C. does not fit in this box." And regarding Microsoft Pocket Word and Excel, she comments, "I don't want that on my palmtop."

3. Functions provided/not provided

Although Subject #2's comment that the palmtop needs a bayonet fitting was made in jest (C, II, 15), it lightheartedly presents the point that this device needs several improvements to be useful for Naval officers. Most Windows CE products currently available provide many of the functions available on a desktop or laptop, but they do not have a method of entering data that is as efficient as these larger devices. The primary complaint of every participant in this study concerned the ineffectiveness of the handwriting recognition software. This may be a result of it being a trial version of the product which does not have all of the capabilities of the full version available for purchase. Nonetheless, many participants expressed a desire to have voice recognition available on a handheld computing device. If this functionality were reliable and could be ported to a small device, such as the one previously described by the participants, it would encourage more widespread use of the palmtop computer among the Naval officer corps.

The Mid-Project Review generated an interesting discussion involving "document-making and note-taking." Most participants would have been more pleased to have an application that allowed them to enter notes in electronic ink rather than having them digitized by the handwriting recognition software and imported as text into the word processor. There are several such products available commercially but none of them were included in this study. Since handwriting recognition and electronic ink note-taking are not an inherent function of Windows CE devices, right-out-of-the-box, this palmtop was not found to be immediately ready for use by these Naval officers.

The fact that palmtop computers are more applicable in some jobs than others was presented by Subject #1. During personal interviews she discussed how she could have

used this device more thoroughly in previous job assignments, "but as an XO [Executive Officer], someone else takes notes while I'm in a meeting and I really don't need a spreadsheet." She describes herself as "Fascinated with the technology!! Love the idea of it -- can see real potential. But, [it] just didn't end up being the kind of tool I need in this job" (C, II, 16). During the course of the study she discovered that what she needed was not a palmtop computer but an electronic organizer that is available for a fraction of the price.

F. USE OF A PALMTOP TO ASSIST IN DAILY JOB TASKS (WILLINGNESS TO USE A PALMTOP)

The NPS-SOPCP discovered numerous factors that discouraged the participants in this study from using the palmtop. Primarily, these were ergonomic design problems that will be difficult to solve given the computer's size constraints. Data entry, as discussed above, was frequently cited as the reason for many of the participants' dissatisfaction with the device. The size also contributes to a more fundamental issue of portability. Although the palmtop is significantly smaller and more portable than a laptop, it was too large to fit into military uniform pockets and was described as cumbersome (C, II, 15). Consequently, subjects were less willing to carry it with them while at work. For that reason, it did not prove to be an effective aide to these Naval officers in managing information in their routine tasks.

G. PARTICIPANT'S ADDITIONAL APPLICATIONS AND FUNCTIONS

All participants were encouraged to use the palmtop however they deemed necessary, for as many tasks as possible. Some subjects were quite exploratory in their utilization of the device while time constraints and busy schedules prevented others from using the handheld computer on a regular basis. The general increase in values of Device Preference tabulated in Table 4.3 indicate that these participants attempted to utilize the palmtop. Ergonomic design issues were found to be the primary factor that prevented participants from even wanting to experiment. In summary, palmtop usage by members of this study group appeared to be proportional to computer expertise. Subject #4, an avid computer user, states this most appropriately, "The size is fine, but the program layout and data entry method can make most computer non-users uncomfortable...it needs more of a familiar pen and paper feel" (C, II, 15).

H. DATA INCONGRUENCE

Having discussed the study project participants' descriptions of an ideal handheld computing device and their comments during project meetings, an incongruence becomes obvious. NPS-SOPCP Survey responses to Question #19 indicate that they would like devices that incorporate numerous capabilities. But their comments during meetings described a device that was quick and simple to use. This may indicate that there is, in fact, confusion as to what capabilities a palmtop should provide. The contention about what is the right device seems to be based on two distinct design paradigms: 1) strip it down to a simplistic device that presents all functions for ready use and 2) build in

numerous functions typical of full-size PCs but make them more efficient and effective than they are currently.

V. CONCLUSIONS

A. SUMMARY OF FINDINGS

The previous chapters have presented a great deal of handheld computer technical information compiled from numerous published sources and actual user data from Naval officers through the Naval Postgraduate School Staff Officer Palmtop Computer Project. The interpretation of the NPS-SOPCP data and information has been discussed in Chapter IV. This chapter will summarize all these interpretations to provide "big picture" conclusions.

1. Impact of IT-21 on the Use and Procurement of Palmtop Computers in the United States Navy

The compatibility of Microsoft CE-based palmtops allows for relatively simple and reliable connections to existing IT-21 compliant Naval networks via Windows 95 or Windows NT clients. However, presently, these palmtop computing devices do not support network protocols such as Windows NT or Novell NetWare. Therefore, although they are compliant with IT-21 requirements, they currently cannot take full advantage of the power provided by extensive Naval information networks. The only tasks that are available to a palmtop computer via a network connection are that of synchronization and file transfer. Also, only specific file types may be transferred and manipulated by the handheld device. Windows CE, being a scaled-down subset of the Windows 95 operating system, does not process the same types of files and must convert those files that it recognizes into a compatible format.

Network resources other than the host PC that is running the Windows CE Services proprietary software are not accessible to the palmtop user. For example, using a PCMCIA modem, a remote user may access an intranet via a dial-up connection if that network has RAS servers operating. From that point, the user then has access to email and the World Wide Web and also may synchronize mobile device data with data on a connected host PC. The mobile device must have first established a "Partnership" with the PC in order to synchronize schedule, task and contact data in addition to file transfers. The remote user is not able to access files on the host PC unless they are stored in the synchronization folder. Files may only be transferred between the two computers in the previously established partnership. Furthermore, the operator of the host PC is the only user who may transfer files to the handheld computer. The palmtop user cannot select files for download from the host. Third party applications such as Symantec's "pc ANYWHERE CE TM" claim to be able to provide this functionality, but this software was not a part of the NPS-SOPCP trial study.

Although these handheld computers are IT-21 compliant, it is not likely that they will become a significant line item in Naval command supply requisitions. As the NPS-SOPCP has demonstrated, these devices in their present form, are not highly desired by officers. Without a substantial demand, procurement of palmtops will remain minimal.

2. NPS-SOPCP Performance Indicators

The Naval Postgraduate School Staff Officer Palmtop Computer Project was initially conducted so as to evaluate two qualities relating to the use of palmtop computers. As defined in the previous chapter, "Device Preference" measures the

participant's willingness to employ electronic devices in routine personal and job-related tasks. "Device Proficiency" is an assessment of the participant's familiarity with electronic computing and communications devices and the ability to learn how to use them. During the study, many other areas of interest became apparent which were explored and compiled through project meetings and personal interviews. Figure 5.1 is a graphical presentation of the data compiled in Table 5.1. This data is taken from the NPS-SOPCP Survey Analysis (Appendix D, Part I).

a. Device Preference

The surveys employed in the NPS-SOPCP were specifically designed to evaluate this quality required of every palmtop user. The term was conceived and defined by the author as a means of quantifying data generated for this thesis. Chapter IV and the NPS-SOPCP Survey Analysis of Appendix C thoroughly discuss the measurement, quantification and evaluation of Device Preference. In general, the NPS-SOPCP yielded data indicating a *mean* value of 38.80 (*standard deviation* = 5.81) before subjects were provided the palmtop computers and 42.80 (*standard deviation* = 7.40) after the experiment. The standard deviation of pre-project Device Preference indicates that initially, participants were relatively similar in their willingness to use electronic devices. The increase in post-project Device Preference indicates that participants, at least, attempted to use the devices for routine job-related tasks. Personal interviews established that they subsequently desired to automate many tasks with a portable device, although they would not necessarily select a Windows CE product for this purpose.

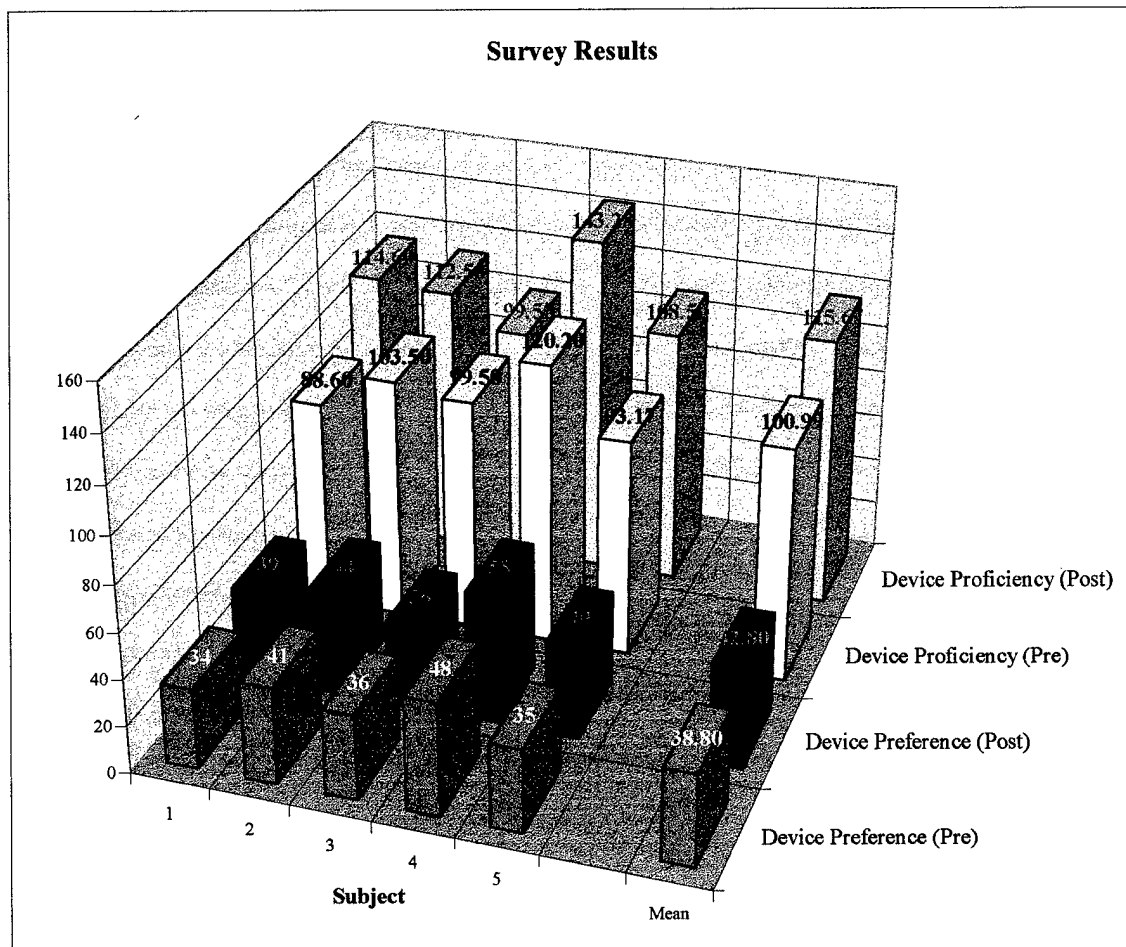


Figure 5.1: NPS-SOPCP Survey Results

Table 5.1: NPS-SOPCP Survey Results

Subject	Device Preference		Post-Pre	Device Proficiency		Post-Pre
	(Pre)	(Post)	Delta	(Pre)	(Post)	Delta
1	34	39	5	88.60	114.60	26.00
2	41	44	3	103.50	112.50	9.00
3	36	36	0	99.50	99.50	0.00
4	48	55	7	120.20	143.28	23.09
5	35	40	5	93.17	108.50	15.33
Mean	38.80	42.80	4	100.99	115.67	14.68
Range	14	19	7	31.60	43.78	26.00
Median	36.00	40.00	5	99.50	112.50	15.33
Mode	N/A	N/A	5	N/A	N/A	N/A
Standard Deviation	5.81	7.40	2.65	12.17	16.48	10.57
Variance	26.96	43.76	5.60	118.43	217.32	89.41

b. Device Proficiency

Table 5.1 indicates that prior to using a palmtop, project participants were somewhat similar in their willingness to learn and utilize electronic devices. The average value for Device Proficiency is 100.19 before palmtop usage. Following the four week study, mean Device Proficiency rose to 115.67, not necessarily indicating that participants became more able to learn to utilize the palmtop, but rather indicating that subjects actually attempted to use the device in many of the areas surveyed. This rise in Device Proficiency is due to higher values placed on survey responses specifying the use of the palmtop or a portable application.

Scoring at approximately the mean for Device Proficiency, Subject #1's final comment on the Palmtop Technology Survey is quite profound and informative, "I ended up not using it the last 10-14 days of the study. I was too busy!" Palmtop computers were invented to provide a resource to assist the busy professional in better

managing tasks. But, as this comment indicates, this subject found this rendition of the handheld computer too difficult or inconvenient to use in many fast-paced situations.

When viewing data for individual participants, it is not all that surprising that Subject 4, a prior enlisted Navy Electronics Technician scored significantly higher than the other members of the group in all categories. His high post scores capture his efforts to use the palmtop in many areas to assist him in his work routines. Subject 3 is the other notable participant. Before and after measurements of both qualities were exactly the same. These statistical values indicate either a lack of actual hands-on palmtop use or perfunctory survey completion. Based on information provided at project meetings and personal interviews, the latter is believed to be the case.

c. Additional Areas of Interest

The principle areas of interest discovered by the NPS-SOPCP involve the ergonomic design of existing palmtop computers. Key participant feedback was received through informal meetings and interviews and also at the project meetings scheduled at the midpoint and at the end of the NPS-SOPCP. Participating officers often stated comments that are the basis for the majority of the ergonomic limitations discussed below in Section C, 1.

Because Windows CE 2.0 and the palmtop devices that utilize it are relatively new, not much data regarding the use of such computers is published. Current periodicals usually contain at least one article pertaining to this type of palmtop. These articles are typically of a technical or functional nature, but many have been found that support the ergonomic issues raised by the project participants.

3. NPS-SOPCP Accomplishments

The Naval Postgraduate School Staff Officer Palmtop Computer Project provided data necessary to analyze the use of Windows CE-based handheld computers by professional Naval officers. As a result of these data, descriptive information of the strengths and weaknesses of these devices has been attained. The specific results are presented in Chapter IV but a summary reveals strengths and weaknesses as perceived by Naval officers, highly mobile professionals with extensive information demands.

4. Benefits Accrued by NPS-SOPCP

The study of palmtop computers in a professional environment has not been well documented to date. The NPS-SOPCP made data generation and compilation possible for the use of these devices in a Naval shore command environment. The Naval officers participating in the study identified numerous ergonomic deficiencies which may be specific to military users. The project also allowed for a reasonably objective evaluation of one implementation of the Windows CE palmtop computer. Only one project participant had any previous exposure to Windows CE devices. The remaining four members of the study group were not at all familiar with them, but all five officers expressed initial motivation to learn and use the HP 360LX. Their comments regarding the shortcomings and benefits of the unit were generic in that they were not specifically critical of Hewlett-Packard (the hardware manufacturer) or Microsoft (the operating

system developer). Additional comments regarding the ineffectiveness of the Calligrapher handwriting recognition software were equally objective.

In general, the following comparison of palmtop types was noted. It is strictly the author's observation and estimation based on readings in current publications and the data generated by this study. The following assumptions are made: 1) individuals involved use some form of Windows on their desktop/laptop computers and 2) individuals have no prior experience using a palmtop. Windows CE tends to be immediately preferable to most users because of its familiar graphical user interface. Figure 5.2 indicates this immediate satisfaction with the device because it is familiar. Satisfaction curves for the Newton and PalmPilot devices are less steep initially, indicating less of a liking of the device. However, as time progresses, Windows CE users tend to become less satisfied as they realize that the CE operating system does not provide the same functions they have on their desktop machines as they initially expected due to the familiarity with the GUI. They are less pleased with functions and stop using them. This has been indicated by the "Functional Dislike Point." The Newton and PalmPilot appear foreign and therefore require more of a learning curve. But, the PalmPilot is preferred over the Newton because of its simplicity. Over time, however, most PalmPilot and Newton users seem to maintain satisfaction with their devices.

Figure 5.3 presents the users' performance with the device. Once again, because of familiarity with the similar desktop operating system, Windows CE users become proficient quickly while there is slightly different learning curve for the PalmPilot and Newton. Although it takes longer to become proficient with the Newton, the final performance is slightly less than the Windows CE device due to the more capable and

complex operating system of the CE device. The PalmPilot is similar but its final performance is significantly less than both the Windows CE and Newton devices.

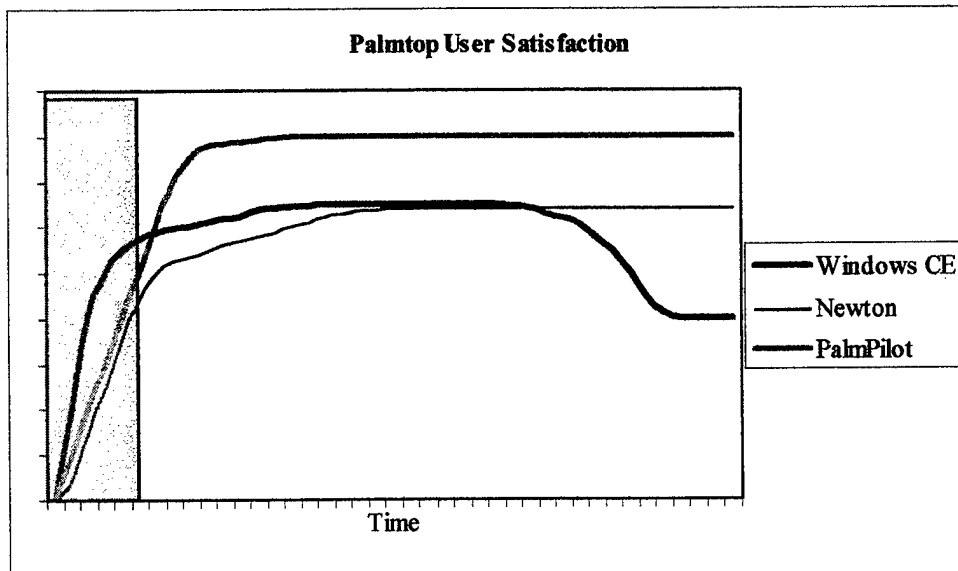


Figure 5.2 : Palmtop User Satisfaction

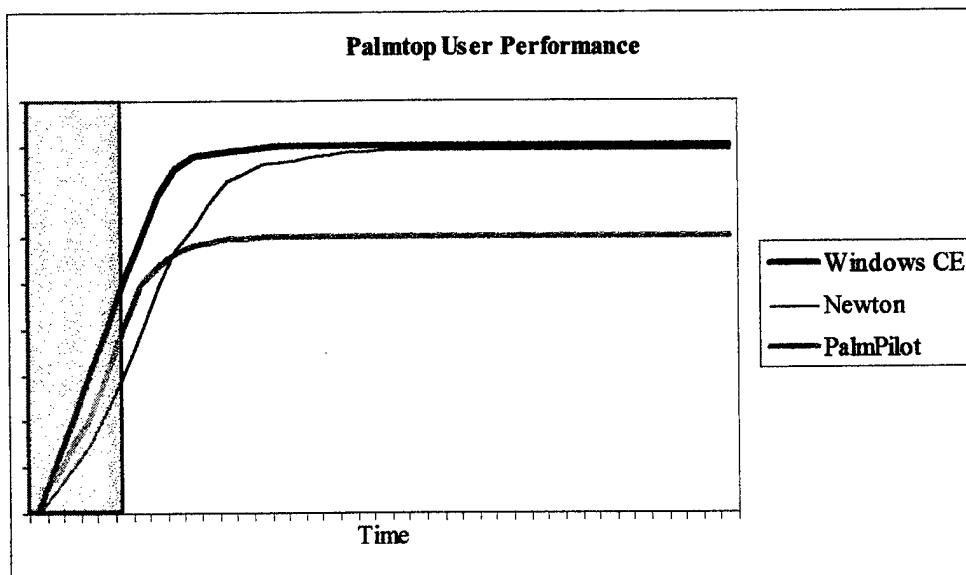


Figure 5.3 : Palmtop User Performance

Most studies of palmtop usage and satisfaction appearing in current publications are short-range, lasting between an hour and, at most, a week or two. The results of these studies typically reveal data producing curves similar to the shaded regions of Figures 5.2 and 5.3. Near the end of this period is the "Novelty Wear-Off Point" at which the slope of the curves tends to decrease until they level off. During this time, the user has reached the point of diminishing returns - the user is deriving a smaller increase in satisfaction per unit time. The NPS-SOPCP study, because of its length of four weeks, allowed for compilation of data reaching into the declining stages of satisfaction with the Windows CE device (following the "Functional Dislike Point"). At this point the user experiences a loss of satisfaction per unit time. After the user stops using functions that were found to be inconvenient or not relevant, (such as the handwriting recognition and email applications in the NPS-SOPCP) satisfaction again levels off and remains constant.

5. Project Data Incongruence

As discussed previously in Chapter IV, an obvious difference between participants' responses to survey questions and their comments made in meetings exists. This incongruent behavior is interpreted as confusion regarding the trade-off of capability and simplicity that participants believe the palmtop should have. Survey responses described a device that had numerous capabilities yet meeting comments concerned the complexity of the palmtops used in the study. Figures 5.2 and 5.3 present the capability-simplicity trade-off. The more simple, less capable PalmPilot is preferred in the long-term over the more capable Windows CE and Newton handhelds. This is believed to be due to its quick, easy

access to all available functions that the mobile user needs repeatedly. Where as the complexity of the Newton and Windows CE devices seems to deliver satisfaction but not to the extent of the simpler PalmPilot. In the case of Windows CE, this complexity was found to decrease project participants' satisfaction, which lead to decreased use of the device.

6. Limitations of NPS-SOPCP

As described in the previous chapter, the quantification of data is the most significant limitation of the NPS-SOPCP. The qualities of Device Preference and Device Proficiency were devised in order to measure the participants' willingness to use and master an electronic device in their routine personal and job-related tasks. The manner in which survey responses were rated in order to evaluate these qualities were subjective although the methods of application were objective across subjects and survey questions. Responses involving the use of a palmtop computer or other portable devices and applications were assigned the highest weight. This inherently provides an advantage to the handheld device. This method of weighting responses was, however, determined to be the most objective due to the intricacy of assigning values to vastly differing tasks and devices.

Initially, four weeks was thought to be a sufficient length for the study. As participants began to use the devices and later became dissatisfied with ergonomic design issues, in general, they used the handheld computers less. For this reason, the length of the study was sufficient, however, it may have been beneficial to provide the same

participants with a different palmtop product in order to draw a comparison between implementations. For this reason, the study would be extended to allow users the same amount of time to become familiar with and implement the second device.

All participants in the study were assigned to shore commands. More mobile operational units would provide subjects comprising a large portion of the Naval officer corps. This would allow for analysis of the devices in truly Naval environments such as onboard ships at sea and deployed Marine units. Similar studies and field testing have previously been accomplished by the sponsor of this thesis, Marine Tactical Systems Support Activity (MCTSSA). Hewlett-Packard handheld PC were used extensively in the August 1997 training exercise named "Hunter Warrior." This testing is significantly different from the NPS-SOPCP analysis in that it tested the technical feasibility of such devices in a combat environment. These combat-oriented tasks allow deployed Marines to access and provide information typically only available to higher echelons of the C4I community. The NPS-SOPCP allows for analysis of the use of devices in the more corporate environment of a Naval shore command.

7. Role of the System Administrator

During the course of the NPS-SOPCP it became apparent that the information systems administration must play a very active role in any command venturing to implement the use of palmtops in any scale. Configuration settings for remote networking are required so that handhelds may remotely log in via a RAS connection. SMTP email accounts must be available for palmtop users. Scheduling data must be accessible to users

of these devices, and more often than not, these applications must permit group scheduling activities.

In addition to the synchronization and network connection issues, system administrators must consider how to protect against hostile applications such as viruses that may gain access to the network via the palmtop. Amazingly, there are no virus protection applications available for Windows CE devices at the time of this writing.

B. STRENGTHS OF PALMTOP COMPUTERS

Clearly, there are many useful applications of palmtop computers both in and out of the military environment. The bases for many of these strengths, paradoxically, also contribute to the device's weaknesses. Among the most significant benefits that handheld computers provide are its size, resulting in an extremely portable computing platform and its wireless connectivity.

1. Portability

The primary motivation for the development of palmtop computers is portability. Microsoft's initial design specifications for hardware manufacturers constrained the overall size of the units and mandated that the internal power supply consist of only two AA batteries. These constraints have resulted in devices with very small form factors and somewhat varying battery lives.

2. Communications and Connectivity

The infrared port proved to be an extremely useful component of the HP 360LX. Wireless connections are very useful, if not mandatory, in ad hoc meeting environments. Through this port, users may exchange contact information and entire files, as well as print to IrDA compliant printers. The range for such connections is relatively short but it did not present any significant problems in the situations tested. Other methods of wireless communications such as cellular phone connections and RF LANs were not tested in the NPS-SOPCP. Many service providers and product manufacturers were researched for their ability to support Windows CE devices, however, such applications are beyond the scope of this thesis.

C. LIMITATIONS OF PALMTOP COMPUTERS

The benefits of palmtop computers are numerous, as presented in the previous section. However, along with these strengths come significant weaknesses which greatly limit the usability and effectiveness of these portable computing devices. The limitations discovered by the officers of the NPS-SOPCP study group primarily focus upon ergonomic design factors, but research of publications and practical experience reveal additional problem areas relating to hardware and software limitations.

1. Ergonomic Design Factors

Among the most significant ergonomic design problems were size and methods of data entry. Every officer noted that the HP 360LX was small but inconvenient to carry

because Navy and Marine Corps uniform pockets could not completely conceal them or offer sufficient protection from incidental damage. Data entry was the most common complaint voiced by project participants. The keyboards were too small to use efficiently and the handwriting recognition software was ineffective. Additionally, the placement of the keyboard in relation to the display made handwriting difficult as the user's hand often touched the screen providing a second superfluous data input which confused the handwriting software. Participants noted that these devices "try to do too many things." The email capabilities were tested but it is a task that the users preferred to accomplish on their desktop computers. Four out of the five participants expressed the need for a simple note-taking application. Subject #3 stated these sentiments quite accurately, "I need a note-taking device, not a document making device." As a result, most participants limited their use of the palmtops to the simple calendar and address functions, which are available in more conveniently sized devices with significantly smaller price tags.

2. Hardware Limitations

The palmtops utilized in the NPS-SOPCP (HP 360LXs) were based on the Windows CE Version 2.0 operating system. This is the most recent release of the OS and has not been extensively tested. The HP 360LX has 10 megabytes of ROM which houses the CE operating system and Hewlett-Packard's proprietary applications, and eight megabytes of RAM for storage of user data and additional programs (such as the Calligrapher handwriting recognition software). The ROM is not accessible for user storage, therefore, the available RAM is quickly consumed as scheduling, address book

and program code and data are compiled. For this reason, the unit contains a Flash memory card slot providing additional storage memory.

The serial connection to the host PC was found to be another problematic factor. Each of the desktop computers used for synchronization in the study had a nine-pin serial mouse. Therefore, the auxiliary 25-pin serial port was the only other option for connecting the palmtop. This port, coincidentally, shares the same interrupt as most conventional internal telephone modems. When the Windows CE Services software is running on the host, the modem is not able to access the CPU and applications using the modem are not able to execute. A relatively simple solution to this problem is a PS/2 mouse but this requires additional expenditures for equipment and installation which may lead many mobile users who would like to synchronize remotely or access their desktops via applications like "pc ANYWHERE CE TM" to abandon the synchronization process.

All palmtop computers suffer from the same limitation regarding power supplies. The actual portable computing cycle life of these devices varies among different products and manufacturers. In general, the mobile user may expect batteries to last between three hours and one week, depending on features, applications and usage. The HP 360LX provided sustained operation for over eight hours and more than a week when used sporadically without the backlight display and without a PCMCIA modem card installed.

Hewlett-Packard's implementation of the PCMCIA slot was found to be awkward. Modem cards would not seat completely in the units unless they were forced the final eighth of an inch. This proved to be fatal for one of the palmtops in the study. By forcing the PCMCIA card, some of the tiny metallic pins were bent rendering the port inoperable. Another problem arises from the support of third party peripherals. Not all products are

compatible with these devices. The HP 360LX did not recognize several generic PCMCIA cards which included modems and video-out adapters for group presentations. The availability of compatible peripherals is an issue which will surely be rectified as the platform gains notoriety and popularity.

3. Software Limitations

Similar to the hardware compatibility problem, there is not an abundance of software produced for platforms running the Windows CE operating system because it is still relatively new. This lack of applications greatly impacts the device's usability. Software used in the NPS-SOPCP that was installed on the palmtops was extremely easy to download from the host PC. In fact, the Microsoft palmtop-desktop interface was the most effective and reliable of the applications run during the study. However, as the following quote states, inherent functionality provided by the manufacturer is not enough to guarantee the success of any computing platform:

The true value of every computer lies neither in its operating system nor in the minimal package of applications that comes with it. Real computing power is in the hands of the third-party software developers who write programs for every conceivable purpose, many of which the product's original designers never remotely considered...The success of every handheld computer is largely a function of the availability of compatible software. (Sullivan, March 1998)

It remains to be seen if such "killer apps" will increase the palmtop's use and popularity. But more software applications will not improve the shortcomings that this research has discovered.

D. CONCLUSION

In summary, the Naval officers participating in the NPS-SOPCP found this Windows CE device to be too complicated and inconvenient to be readily useful in the majority of personal and job-related tasks. Unlike the PalmPilot which does a few things VERY well, this Windows CE device does too many things only marginally well. As the conflicting data from Appendix B indicates, Naval officers need a simple to operate, portable computing device that fits in a uniform pocket, accepts data through handwriting recognition or voice inputs and has numerous capabilities including: calendar/scheduling with an alarm, task management, contact address management, note-taking, limited word processing, spreadsheet and database management, internet and email access, while providing connectivity for file transfer and printing via a direct cable connection, built-in cellular telephone modem and infrared port. This conflict between simplicity and capability leads to the unanswered question: "What are palmtops and what should they be used for?"

The generation of concise product specifications is often difficult, as the NPS-SOPCP indicated, but it pales in comparison to the engineering, both hardware and software, that must be accomplished to produce such a palmtop computer. Chapter II contains a history of computer developments. This history is quite easily summarized as an evolution of computing devices which package increasing capabilities into smaller and smaller form factors. With this in mind, it will not be long before the device specified by the officers of the NPS-SOPCP is in production. However, as with all technological trends, by that time, the specifications will, more than likely, not be the same.

VI. RECOMMENDATIONS

A. SUGGESTED FURTHER STUDIES

During the course of this research many additional areas of interest arose that were beyond the scope of this thesis. Nonetheless, they are still intriguing and present some very interesting topics for further research.

1. Comparison of Windows CE, Newton and PalmPilot.

This thesis was limited to the use of Windows CE palmtop computers. Some of the other powerful, portable devices such as Newton and PalmPilot provide similar functionality on different platforms. Because many of the complaints that NPS-SOPCP participants had regarding the Windows CE device were ergonomic in nature, a similar analysis of the PalmPilot and Newton could prove to be very informative. A comparison of these devices for their strengths, weaknesses and appropriateness for use by U.S. Navy and Marine Corps officers would be beneficial because their ergonomic designs are entirely different.

This may be difficult due to the recent cancellation of the Newton line of products but many such devices are still available. Furthermore, in considering Apple Corporation's endurance and persistence, it is highly likely that a replacement will be developed to compete against the Windows CE line of products.

2. Longer time period for study.

The length of the NPS-SOPCP was discussed previously in Chapter V. It proved to be a limitation in that there was not sufficient time to upgrade software applications and participants never really attained a sense of ownership for the device. If subjects actually owned the palmtop and were solely responsible for it, they may feel more obligated to make prolonged efforts to use the device. A study in which participants already owned such a handheld computer or were provided one outright without having to return it would have promoted at least one of the subjects of this research to have implemented it more thoroughly. Knowing that this information management tool would be returned after a month, several users stated that they did not want to become too dependent on it.

3. Conduct a similar study using Windows CE PalmPC devices as soon as they are available.

The "Handheld PC," as Windows is touting this form factor of palmtop computers, appears to be the wrong device for the research subjects who participated in the NPS-SOPCP. The PalmPC, similar in design to the highly successful PalmPilot, is currently in development by numerous manufacturers and are due to hit the market in mid to late 1998. These devices will run the Windows CE operating system on a significantly different hardware platform. The literary research conducted on these devices reveals that they meet many of the size requirements delineated by the NPS-SOPCP participants in Chapter IV. A study of these devices in a format similar to that of the NPS-SOPCP

would derive the effectiveness of such products in meeting the routine information management demands of professional Naval officers.

4. Wireless Applications of Palmtops.

The palmtop is, foremost, meant to be a mobile computing device. This research has been limited to the use of such devices in a shore-based Naval command environment. In such an environment, wired connectivity is typically not difficult to attain. However, further research in the area of wireless communications and connectivity for palmtop computers would be extremely beneficial to U.S. Navy and Marine Corps personnel considering that they are highly mobile and require portable means of communication to support their mobile means of computing. Several such projects have been accomplished by the Marine Corps Tactical Systems Support Activity but the need for highly mobile computing systems that can be carried, operated and maintained by an individual in any environment will always be required by the armed services.

There are currently many manufacturers of wireless network systems producing products that allow truly mobile computer users to achieve truly mobile connectivity. Some of these systems have been tested for their use by Windows CE devices, however, there is little documentation of such research. A study that implements a wireless LAN on which palmtop computers are frequently operating will provide many valuable solutions for the mobile personnel of the Department of Defense.

B. SUGGESTED FUTURE DESIGN ASPECTS OF PALMTOPS AND DEVELOPMENT OF APPLICATIONS AND PERIPHERALS

The manufacturers of palmtops invest large amounts of money in the research and development of these product lines. However, the author believes that more of these manufacturers need to acknowledge the strengths and weaknesses of their products and market them appropriately. One device is not the solution to every problem, to market them as if they are is a critical mistake that will lead to consumer dissatisfaction. The makers of the PalmPilot, 3Com U.S. Robotics, are aware that its operating system is not as fully functional as other products on the market, but makes conscious design and marketing decisions that support the products strengths. For this reason, PalmPilot users are very loyal and usually very satisfied with their buying decisions.

The NPS-SOPCP developed specific requirements for a palmtop device. These requirements, as well as research on current trends in computer technology, lead to interesting, feasible and reasonable hardware, software and ergonomic recommendations for product manufacturers.

1. Hardware Recommendations

The following recommendations are intended for hardware manufacturers for the improvement of palmtop devices. Many of these recommendations are technology-dependent and therefore, may not be feasible at the present time, but shall be in the near future.

a. Standardized USB connections to host PCs.

Every palmtop currently available has a proprietary serial connection to the host computer. The newly developed Universal Serial Bus (USB) connection, which is currently reaching widespread use in laptop computers and is gradually migrating to the desktop PC, is superior to the conventional RS-232 connection in four areas. "USB is faster than the serial port, offers Plug-and-Play connectivity, supports daisy-chained peripherals and carries electrical power to peripherals in addition to data." (Forman, p. 146). The maximum data transfer rate of the conventional RS-232 connection is 115kbps, while the USB's faster connections (1.5 or 12Mbps) also allow for multiple components to be connected simultaneously. Universal Serial Bus, as the name implies, is a serial connection that permits the linking of up to 127 devices so that one port can provide communications with multiple components. Because it is Plug-and-Play with Windows 95 and the soon to arrive Windows 98, USB provides on-the-fly allocation of system resources so little or no configuration by the user is required. Low power peripheral components designed with USB connections can be powered by the computer's power supply rather than using a separate electrical outlet. This is a welcome improvement to any computer user whose feet can hardly fit beneath a desk crowded with extension cords and surge protectors.

Currently, mapping applications use Global Positioning System (GPS) antennas to receive positioning data from satellites. These antennas often require a source of power such as a battery or external AC/DC supply. Other peripherals that the palmtop user may wish to connect to the handheld device include digital cameras, printers, external modems or even a full-size keyboard to solve the problem of data entry. All of these

devices could be used simultaneously through a USB connection. The existing proprietary serial port on palmtops only allows for the connection of a single component. The ability to power some of these devices through the USB port would simplify the operation. For example, consider the palmtop owner who uses her device in the car while travelling. She can connect a GPS antenna to the handheld and be able to track her precise location as she drives while only using one DC adapter plugged into the solitary cigarette lighter on the dashboard. Now, consider the Marine performing reconnaissance in the field. He can take photos of an area using a digital camera. These photos can then be sent to a palmtop to be analyzed and annotated. If a GPS antenna is also attached, location information can be stored with the image as well. The palmtop then may be linked to a digital radio to transmit the annotated image to decision-makers in the rear. The USB port would allow the Marine to carry a single battery pack to power all of these components while simultaneously connected to the palmtop.

A few USB peripherals are currently available with many undergoing research and development. One such example is a keyboard with a four-port USB hub to allow for other components to connect to the USB port of the personal computer. With the growth of video teleconferencing as a means of corporate and personal communication, the USB's high data rates allow for higher quality output from digital cameras. Also available are optical scanners, mice and monitors. This simple, compact connection port and its associated jack is sure to replace the bulkier RS-232 connection that is not feasible for use on palmtop computers. As this occurs, more and more peripheral devices making use of the USB will become available. Windows CE must incorporate the capabilities USB before any such use is possible.

b. Use of the Flash RAM card slot for wired connection.

Many palmtops incorporate a flash memory card slot to allow for expansion of RAM. Until the USB port becomes a standard connection on handheld computers, the flash RAM card slot could be used to connect peripheral devices such as a digital camera, a serial connection to another palmtop or a GPS antenna. This slot currently is not intended for use as a communications port, but relatively simple modifications to the operating system could enable such use.

c. Integrated cellular phone capability.

To make the palmtop a truly portable computer, it should have portable communications capabilities. By incorporating cellular access components into the design of palmtop computers, users could transmit and receive data without the additional awkward connection to a cellular phone. But data transmission is not the only form of communication that mobile computer users may require. If an integrated cellular connection is incorporated into the device, why not completely eliminate the need for the cellular phone by also incorporating a full duplex microphone and speaker to allow for voice communication? Nokia, the manufacture of a popular line of cellular PCS phones has produced a model that is "useful as a self-contained organizer and multifaceted communications device...looks like a fat cellular phone...but opening the cover reveals a 1.4 by 4.5 inch LCD screen and a full but tiny QWERTY keyboard with numerous navigation and selection keys." (Anthony, p.116). This device provides the functions

previously discussed but also allows the user to access the Internet and many of the capabilities provided by Windows CE devices. To borrow the title of Robert S. Anthony's article, this combination of functions seems to define the "The Ultimate Personal Peripheral."

The palmtop is not the final destination of the Windows CE operating system. Dr. Ted Lewis effectively presents problems relating to Windows CE and wireless connectivity:

Although initially positioned as an OS for handhelds retaining the Windows 95 look and feel, Microsoft intends CE to become the dominant OS in the consumer-electronics market...one of the major benefits of IA [information appliance] gadgetry is its small form factor. This makes mobility a prime requirement, which in turn makes wireless connectivity a prime directive. Yet pervasive wireless is expensive, relies on immature standards and technology and lacks bandwidth. (T. Lewis, p. 67-68).

2. Ergonomic Design Recommendations

The following recommendations concern both hardware and software manufacturers. These issues usually arise due to interfaces between hardware and software elements or between the human and hardware components.

a. Variable display orientation.

The ergonomic problems of the keyboard and display layout were noted in previous chapters. Many of these problems would be alleviated if the display could be rotated 90 degrees in both directions. By rotating the entire palmtop 90 degrees, the user's hand would not rest on the keyboard, accidentally pressing the keys. Furthermore,

superfluous screen entries would be made because the user's hand would no longer rest on the display. Incorporation of this feature should also rotate the orientation of the application. The Calligrapher handwriting recognition software allows for rotating the orientation of that application, but the underlying program into which the digitized text is imported remains oriented with the keyboard. This makes review of entered data inconvenient.

b. Retractable keyboard or hard cover to keep hand off keys while writing on screen.

As discussed previously, the majority of project participants commented on the layout of the keyboard in relation to the display. Their survey responses describe using the keyboard as a last resort for data entry. Since users would prefer other methods of data entry, the keyboard could become a less conspicuous part of the palmtop. The Newton MessagePad line completely eliminated the keyboard as a portion of the basic computing device but made it an accessory. With capable handwriting recognition and navigation controls, this is viable alternative. However, a simple hard cover for the keyboard would successfully prevent unintentional character entry while writing on the display. After all, carbon copy checkbook ledgers have always implemented such a simple and effective component.

Unlike a detachable keyboard, a retractable model would always be available to the user for entering data. Credit card-sized calculators often use touch pads with protruding bubbles for the various numbers and functions. Since space is an

extremely limited commodity in a palmtop, such a keyboard could be implemented while allowing it to be compact enough that it could retract out of the way when not in use.

c. Voice recognition.

Several NPS-SOPCP participants noted voice recognition as a convenient and desirable addition to the palmtop's data entry methods. This is no small feat as handheld computer manufacturers can attest. This technology is just now becoming effective for use on desktop PCs with superior hardware components and minimal size constraints. To port this functionality to a palmtop computer will take time but will surely happen in the future. During the Mid-Project Review Subject #5 made the following statement, "When I am mobile, I need to note now and organize later." Some palmtops currently available are able to record voice notes in a digital format that can be transcribed later. This is necessary capability, however, users are thinking in the long-term when they want to communicate with their computers in the same ways they communicate with each other. There is no such product in existence and it remains to be seen whether this would be a function that most users find acceptable, but this is an area that is worth investigation.

3. Software Recommendations

The following recommendations concern the development of effective software applications for the Windows CE palmtop. While such products are currently being produced software developers, additional mobile applications are in demand.

a. Integrated Handwriting Recognition.

Handwriting recognition has been discussed extensively throughout this research. Therefore, it is appropriate that recommendations regarding its use on palmtops are presented. Written notes are one of the most popular and widely used means of communication and palmtop users want to be able to communicate with their devices in comfortable, familiar and convenient ways. Since miniaturized keyboards often are not conducive to timely, accurate data entry, handwriting recognition is a critical component of any handheld portable computing device.

The "add-on" handwriting recognition application used in this research failed to meet the participants' needs and, consequently, was not utilized as the study progressed. Reasons given for not using this function included poor recognition of words leading to repeated writing attempts and eventually to keyboard entry. Participants viewed this as wasted time and became impatient and intolerant. Because handwriting is a less obtrusive process than typing in social situations, software applications that provide this capability must be effective in converting the user's inputs to text accurately on the first attempt. Like the keyboard interface, such a capability should be an inherent component of the operating system or, since Windows CE is destined to power many home appliances and other electronic devices, it should be added to the capabilities that handheld PC manufactures provide in bundled software.

b. Note-taking versus document making.

NPS-SOPCP participants frequently mentioned a note-taking application, not a word processor is more what they need. Both applications are useful to the mobile computer user, but for the purposes of most professional Naval officers, the capability to write a quick note in electronic ink rather than compose a digital text version of their handwriting is more important because it saves time. Such notes can later be transcribed if necessary. There are currently software products available that provide this function. Unfortunately, they were not included with the palmtops used in this study. Like handwriting recognition, handheld PC manufactures should make such a note-taking function an integral part of the devices they produce.

c. Conversion from group scheduling applications to Schedule+ or Outlook.

Software incompatibility issues prevented many NPS-SOPCP participants from synchronizing their palmtop schedules and contacts with their desktops. The Naval Postgraduate School is currently using the group scheduling application Group Wise. A conversion to Microsoft Outlook or Schedule + was not readily available, so participants were forced to enter scheduling data twice. The author has encountered the same problem with Lotus Organizer. Scheduling and contact data should be transferred in a simple flat file in delineated text format so that any desktop application may synchronize with the palmtop's Outlook database. Furthermore, users may wish to use other software applications to provide the capabilities of its proprietary applications which are packaged

within the operating system. This is not a big deal for desktop users, but for palmtop users who must adhere to strict memory constraints, they may wish to use their precious system memory for more friendly and effective scheduling and contact management applications.

d. Personal financial management applications for Windows CE.

Software developers should pay special attention to the needs of mobile computer users. The checkbook ledger is a function that could easily be automated through software applications. People who carry a checkbook, wallet and day-timer could forsake two of these items and simply use a palmtop to manage their checking accounts, as well as their schedules and contacts. Applications such as Intuit's Quicken® for desktop PCs have allowed the personal computer user to better manage their funds. A mobile version of such applications would allow for single point data entry that would then be synchronized with the desktop's data to maintain an accurate and simplified financial record that is always up to date.

C. RECOMMENDATIONS FOR CHIEF INFORMATION OFFICERS AND CONSUMERS

Consumers in the market to buy a Windows CE palmtop must clearly determine how they will use the device. While they all run the same operating system, different units have different strengths and weaknesses. As with shopping for a new car, it is critical that the palmtop shopper be aware of limitations of products to ensure that the right buying decision is made. This also applies to the military officer in the CIO position.

Procurement of the right computer for the right task is often difficult. And with the rising popularity of handheld devices, the CIO must stay abreast of the products available and the technologies driving the development of such products. As the participants of the NPS-SOPCP verified, the right computer for the right job must meet well defined size, capability and price specifications.

APPENDICES

A. GLOSSARY OF TERMS

Appendix A has been included to provide context-related definitions of words, terms and phrases used throughout this thesis.

B. NAVAL POSTGRADUATE SCHOOL STAFF OFFICER PALMTOP COMPUTER PROJECT SURVEYS

Appendix B contains the two surveys completed by the Naval officers who participated in the Naval Postgraduate School Staff Officer Palmtop Computer Project.

- 1. NPS-SOPCP Survey**
- 2. NPS-SOPCP Palmtop Technology Survey**

C. ANALYSES OF NPS-SOPCP SURVEYS

Appendix C contains two spreadsheets for the interpretation and analysis of the responses attained in the NPS-SOPCP surveys.

- 1. NPS-SOPCP Survey Analysis**
- 2. NPS-SOPCP Palmtop Technology Survey Analysis**

APPENDIX A: GLOSSARY OF TERMS

AutoPC - A conceptual product under development that will run the Microsoft *Windows CE* operating system. This computer will replace the car stereo and provide personal computer capabilities as well as AM/FM stereo and CD or cassette functionality for the driver and passengers. GPS navigation and traffic routing are planned functions to be implemented.

Cellular Phone - A *wireless* communications device providing telephone *connectivity*.

Click - Pressing the *mouse* button to select an icon in *PC* operating environments.

Client - A *networked personal computer* that requires resources provided by other computers according to the *Client-Server Model* for network computing. {See also; *Workstation*}

Client-Server Model - A computer network architecture model in which personal computers (*clients*) access files and applications stored on computers with more storage and/or processing capability (*servers*).

Collection - The gathering of *data* from all sources including the environment and other contributing factors.

Connectivity - The linking of a computing device to a network. May be physical as with telephone or Ethernet cables or may be wireless with *radio frequency* or *cellular phone modems*.

Data - raw vocal, numerical, written or observed facts about a specific topic.

Data Synchronization - {See also; *Synchronization*}

Day-Timer - {See also; *Organizer*}

Desktop PC - The largest form of *personal computers* designed to provide computing capabilities in a static environment. Desktop PCs often combine multimedia capabilities with significant processing and storage components.

Device Preference - A measurement of *Naval Postgraduate School Staff Officer Palmtop Computer Project (NPS-SOPCP)* participants' willingness to employ an electronic device to assist with routine personal and job-related information management tasks.

Device Proficiency - The quality of subjects participating in the *NPS-SOPCP* which describes their familiarity with electronic computing and communications devices and their ability to learn how to use them.

Flash (Memory) Card - A compact portable storage device that may also provide additional RAM in *Handheld* and *Laptop* PCs.

Graphical User Interface (GUI) - Application providing easier human-computer interaction. A layer of abstraction which gives the user access to functions of the operating system. GUI usually requires an additional *Input Device* such as a *Mouse* or *Stylus*.

GUI - {See *Graphical User Interface*}

Handheld PC (H/PC) - A miniature version of the *personal computer* that runs *Windows CE*, a scaled-down version of a *PC* operating system. Usually small enough to fit into a suit pocket, purse or briefcase making them highly portable, these devices provide data sharing and *synchronization* with *desktop* or *laptop PCs*. However, software applications and file formats are usually not compatible with conventional PCs. {See also; *Palmtop*, *PC Companion*, *Personal Digital Assistant (PDA)*, *Pocket-Sized Computer*}

HDML - Handheld Device Markup Language - *HTML* for *palmtops*.

Host (or Host PC) - The personal computer running the proprietary “*Windows CE Services*” software. This is the computer with which the handheld device has established a “*Partnership*” that allows for data synchronization and file transfer.

Hot Synch - Immediate *synchronization* of data between a *PDA* or *H/PC* and a *desktop* or *laptop* computer. {See also; *Data Synchronization*}

H/PC - {See *Handheld PC*}

HTML - Hypertext Mark-up Language, a basic programming language used in *Web*-based applications to present *multimedia data* in a hardware independent format. Allows for the same code to be *processed* by computers operating as *PCs*, Macintosh, UNIX, etc.

Hybrid PC - *PC* that combines two or more types of computers. In the context of this thesis this term refers to a computer approximately the size of a *handheld PC* that runs a conventional PC operating system. {See also; *Sublaptop*, *Subnotebook*}

Information - Processed *data* which yields new, informative and useful facts. Information may then be *processed* repeatedly to yield more and more abstract facts.

Infrared - Electromagnetic radiation in the spectrum of wavelengths between visible light and **microwaves**. Used for short range, low bandwidth **data** communications.

Input Device - Low-level communications device through which the user conveys **data** and/or control instructions to the computer's operating system.

Interface - The juncture between two software and/or hardware components. {See also; **Graphical User Interface, GUI, User Interface**}

Internet - First large-scale computer **network** developed by the U.S. Department of Defense and subsequently expanded to include public and private civilian networks. {See also; **Web, World Wide Web (WWW)**}

Intranet - Term describing a private or public enterprise computer **network**.

IrDA - Infrared Data Association, a standard governing a specific protocol for **infrared** data communication.

LAN - {See **Local Area Network**}

Laptop - Also known as a **Notebook**, these portable **personal computers** provide the same or similar capabilities as **desktop PCs** but in a smaller **form factor** designed initially for mobile users. {See **Notebook**}

Local Area Network (LAN) - Computer **network** serving a single building, group of buildings or a facility in the same geographic proximity.

Mainframe - A powerful computer with multiple processors, having the capacity to process many tasks for many users simultaneously. The largest of the computer hierarchy.

Microcomputer - The first evolutionary step toward a single user computer. These computers had only one central processor with little or no multiprocessing capability. Between **Minicomputers** and **Personal Computers** in the computer hierarchy.

Microwave - Very high frequency/low wavelength (4-44 GHz) electromagnetic radiation following the **infrared** spectrum. Used in cellular, "long haul" and **satellite communications**.

Minicomputer - Originally named mini-mainframes, these smaller versions of the **mainframe** computer provide sophisticated multiprocessing capabilities but with less capacity. Between **Mainframes** and **Micro-Computers** in the computer hierarchy.

Modem - Modulator/Demodulator, used to convert digital computer signals to analog for telephone transmission. This term is generally used to refer to the computer component providing this service.

Mouse - An auxiliary *input device* used to convey *data* and/or control instructions to a *desktop personal computer's* operating system. {See also; *Input Device, Pen, Stylus*}

Multimedia - Term referring to audio and video *data*. These two formats may be combined as in movies or separate such as sound bytes or still photos.

Naval Postgraduate School Staff Officer Palmtop Computer Project (NPS-SOPCP) - The study project designed and implemented to generate and compile data for this thesis. This data specifically describes the use of palmtop computers by professional Naval officers that are not directly involved with education at the Naval Postgraduate School.

Network - A system composed of interconnected computers capable of communicating with each other.

Notebook - {See *Laptop*}

NPS-SOPCP - {See *Naval Postgraduate School Staff Officer Palmtop Computer Project*}

Organizer - {See also; *Day-Timer*}

PalmPC® - A conceptual product in development that will run the Microsoft *Windows® CE* operating system. This palmtop computer is being designed to be a competitor for the PalmPilot™ in the *PDA* market.

Palmtop - A miniature, highly portable computer providing limited *processing* and *storage* capabilities. Traditional palmtops differ from *H/PCs* because they run proprietary operating systems that may or may not provide data sharing and synchronization with desktop or laptop *PCs*. {See also; *Handheld PC (H/PC), PC Companion, Personal Digital Assistant, PDA, Pocket-Sized Computer*}

Partnership - Microsoft Windows CE term used to describe the establishment of a connection between a Windows CE handheld computer and a *Host PC* running the "*Windows CE Services*" software and either the Windows 95 or Windows NT operating system.

PC Companion - A more accurate term used to describe a pocket-sized computer running the *Windows CE* operating system. {See also; *Handheld PC, H/PC, Palmtop, Personal Digital Assistant, PDA, Pocket-Sized Computer*}

PCMCIA Card - Personal Computer Memory Card International Association established in 1989 to develop standards for portable microelectronics devices for data storage. The PCMCIA standard later evolved to encompass communication devices such as telephone and *modems*, digital cameras, *LAN* connections and video adapters for *Laptop*, *Sublaptop* and *Palmtop* computers. In this thesis, the term PCMCIA Card or **PC Card** shall be used interchangeably to refer to such peripherals.

PC Card - {See **PCMCIA Card**}

Pen - An *Input Device* commonly used with *Handheld PCs*. {See also; *Input Device* , *Mouse*, *Stylus*}

Personal Digital Assistant (PDA) - A miniature, highly portable device providing information organization and storage. Typically used as an electronic *organizer* to store calendar and contact information. Often used to describe a device with more computing power such as *Handheld PC (H/PC)*, *Hybrid PC*, *Palmtop*, *PC Companion*, and *Personal Digital Assistant (PDA)*.

Personal Computer (PC) - Generally referring to computers designed initially for stand-alone use in corporate environments, they have become common in households throughout the United States. IBM first coined this name and so it is used primarily when discussing IBM-based computers. The last member in the computer hierarchy.

Pocket-Sized Computer - The general term used to encompass all other names for miniaturized computers including *Handheld PC (H/PC)*, *Hybrid PC*, *Palmtop*, *PC Companion*, *Personal Digital Assistant (PDA)*, *Sublaptop* and *Subnotebook*.

Presentation - Displaying *data* and abstracted *information* in a manner which facilitates comprehension and/or learning.

Processing - manipulating data through calculations and/or filtering to abstract information.

Radio Frequency (RF) LAN - Local area computer network in which *connectivity* is achieved through radio wave transmission of data.

Remote Access - The capability to access a computer system through telephone or *network* connections.

Retrieval - Locating stored data and loading into memory for the purpose of *Processing* and/or *Presentation*.

RF - {See *Radio Frequency (RF) LAN*}

Satellite Communications (SATCOM) - Data transmission between ground or air devices and satellites via electromagnetic radiation in the microwave spectrum.

Server - A networked computer that provides file or application sharing services to clients according to the *Client-Server* computer network model.

Storage - Retaining collected *data* in a location (physical and/or virtual) until needed for *processing*.

Stylus - {See *Pen*}

Sublaptop - A PC that packages most of the functionality of a *laptop* in a device approximately the size of a *Handheld PC*. {See also; *Hybrid PC*, *Subnotebook*}

Subnotebook - {See *Subnotebook*}

Super Computer - A computer or group of computers linked together providing increased *processing* power to solve complicated tasks.

Synch - Short for *Synchronization*.

Synchronization - {See *Data Synchronization*}

Tap - The equivalent of *click* for *Handheld PCs*. Action is performed by using a *stylus* on the display screen.

Telecommuting - Term used to describe professionals who are often mobile and usually do not have a formal office. Work is completed in ad hoc environments or in in-home offices then transmitted electronically to others.

User Interface - {See *Graphical User Interface, GUI*}

WAN - {See *Wide Area Network*}

Web - Short for *World Wide Web (WWW)*.

Wide Area Network (WAN) - Computer network that presides *connectivity* between two or more geographically dispensed *Local Area Networks*.

Windows® CE - A scaled-down version of the conventional PC operating system, Windows® 95, designed to be run on the *handheld personal computer*, *AutoPC®*, and *PalmPC®*. Devices based on this operating system may establish

a connection or "**Partnership**" with **Host PCs** running Windows® 95 or Windows® NT.

Windows® CE Services - Proprietary Microsoft software that enables a connection or "Partnership" between a Windows CE device and a personal computer, also known as the Host PC.

Wireless - Communication media which do not require physical connections such as telephone or Ethernet cables. This term usually refers to **Radio Frequency (RF)**, **Microwave**, **Cellular Phone**, **Infrared** or **Satellite Communications (SATCOM)**.

Workstation - A networked personal computer for business environments, usually possessing increased processing power compared to home PCs. {See also; **Client**, **Client-Server Model**}

World Wide Web (WWW) - Computer communication **network** composed of the **Internet** and numerous other independent **intranets**.

[THIS PAGE INTENTIONALLY LEFT BLANK]

**APPENDIX B: NAVAL POSTGRADUATE SCHOOL STAFF OFFICER
PALMTOP COMPUTER PROJECT SURVEYS**

PART I: NPS-SOPCP SURVEY

SUBJECT #1

1. When you get to your office, what is the **first** piece of information you check? (Please indicate only one):

Pre		Post
<input checked="" type="checkbox"/>	daily schedule	<input checked="" type="checkbox"/>
<input type="checkbox"/>	"to do" list	<input type="checkbox"/>
<input type="checkbox"/>	voicemail and phone messages	<input type="checkbox"/>
<input type="checkbox"/>	plan of the day	<input type="checkbox"/>
<input type="checkbox"/>	email	<input type="checkbox"/>
<input type="checkbox"/>	headline news from newspapers	<input type="checkbox"/>
<input type="checkbox"/>	headline news from web sites	<input type="checkbox"/>
<input type="checkbox"/>	headline news from another source	<input type="checkbox"/>
<input type="checkbox"/>	other, please specify: _____	<input type="checkbox"/>

2. Please list and describe the **three** most important **job-related tasks** you do upon arriving at your office (Use as much space as you need, please feel free to use the back of this page if necessary):

Pre	Post
<ul style="list-style-type: none"> - e-mail - reading & responding - phone messages - checking calendar to see what meetings, etc. are scheduled for the day. - to-do list / tickler review 	<p><u>Same</u></p>

For questions 3 and 4 please indicate all items that you use in the "USE" column and rank them in order of importance, with **1 being most important** in the "RANK" column.

3. What types of **work-related** information do you need **immediate** access to throughout the typical work day? (indicate all that apply):

Pre			Post	
USE	RANK	ITEM	USE	RANK
<input checked="" type="checkbox"/>	1	daily schedule	<input checked="" type="checkbox"/>	1
<input checked="" type="checkbox"/>	3	"to do" list	<input checked="" type="checkbox"/>	3
<input checked="" type="checkbox"/>	5	address book	<input checked="" type="checkbox"/>	5
<input checked="" type="checkbox"/>	4	project documents	<input checked="" type="checkbox"/>	4
<input type="checkbox"/>		news headlines	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	6	financial reports	<input checked="" type="checkbox"/>	6
<input type="checkbox"/>		voicemail	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	2	email	<input checked="" type="checkbox"/>	2
<input checked="" type="checkbox"/>	7	world wide web browsing	<input checked="" type="checkbox"/>	7
<input type="checkbox"/>		other (please specify): _____	<input type="checkbox"/>	

4. What types of **personal** information do you need **immediate** access to throughout the typical day? (indicate all that apply):

Pre			Post	
USE	RANK	ITEM	USE	RANK
X	1	daily schedule	X	1
X	2	"to do" list	X	2
X	3	address book	X	3
		project documents		
		news headlines		
		financial reports		
		voicemail		
		email		
		world wide web browsing		
		other (please specify):		

5. Please select **all** of the following **items** that you utilize regularly. Indicate if you maintain a resource for **work**-related and/or **personal** information, if they are in the **same** or **separate** objects and please list whether they are **paper-based** or are **automated** through your computer (desktop, laptop or PDA - do not indicate type of computer):

PRE:

Item	Work	Personal	Same	Separate	Paper-based	Automated
desktop calendar	X	X		X	personal	work
date/timer (scheduler)	X					X
"to do" list	X	X		X	personal	work
post-it notes ("yellow stickies")	X	X		X	X	
financial records	X	X		X	personal	work
note pad	X	X		X	X	
other						
other						
other						

POST:

Item	Work	Personal	Same	Separate	Paper-based	Automated
desktop calendar						
date/timer (scheduler)	X	X		X	personal	work
"to do" list	X	X		X	personal	work
post-it notes ("yellow stickies")	X	X		X	X	
financial records	X	X		X	personal	work
note pad	X	X		X	X	
other address book	X	X		X	personal	work
other						
other						

* please note: am shipping
for an electronic organizer
(date/timer, scheduler, address book)
to combine work/personal
info as a
result of this study

6. How do you remind yourself of what you need to do during the day?

Pre		Post
	I don't keep reminders	
	"to do" list on a paper-based planner	X
X	"to do" list on a desktop computer	
	"to do" list on an electronic organizer (Rex, Casio organizer, etc.)	X
	"to do" list on a dry erase board or chalk board	
X	post-it notes ("yellow stickies")	X
	string around finger or rubber band around wrist	
	pocket voice recorder or message recording pen	
	other (please specify):	
	other (please specify):	
	other (please specify):	

→ am curr
shopping
one as a
result of
this
CMMO

7. What are the three most often used things on your desk?

Pre		Post
	PC - email / word / perfect / Internet	PDA (TASK LIST)
	Notebook (paper)	CALENDAR
	In-box	IN-BOX

COMMUNICATION
PER PHONE
COMMUNICATION
25 FEB 98
BNS

8. How do you organize your work files? (choose the most applicable):

Pre		Post
	by project	
X	by topic	X
	by type	
	by date	
	other	

9. How often do you organize your work-related files? (choose the most applicable):

Pre		Post
	Once per day	
	a couple of times per week	
	once per week	
	a couple of times a month	
	once a month	
X	hardly ever	X
	never	
	other	

10. How do you organize your **personal** files? (choose the most applicable):

Pre		Post
	by project	
X	by topic	X
	by type	
	by date	
	other	

11. **How often** do you organize your **personal** files? (choose the most applicable):

Pre		Post
	once per day	
	a couple of times per week	
	once per week	
	a couple of times a month	
	once a month	
X	hardly ever	X
	never	
	other	

12. How do you communicate with people in job-related activities? (indicate **all that apply** in the "USE" column and then rank them in the "RANK" column with **1 being most important**):

Pre			Post	
USE	RANK	MEANS OF COMMUNICATION	USE	RANK
		video conferencing		
X	2	email	X	2
		pager/voicemail		
		telephone (cellular)		
X	3	telephone (regular)	X	3
		radio (walkie-talkie)		
X	4	written notes	X	4
X	1	other (please specify): face to face	X	1

13. Which of the following electronic devices do you currently use routinely in your job? (indicate all that apply):

Pre		Post
	laptop computer	
X	desktop computer	X
	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	X
	cellular phone	
	pager	
X	fax machine	X
	camera (digital)	
	camera (film)	
	radio walkie-talkie	
	other (please specify):	

14. Which of the following electronic devices have you used in your job? (present or past - indicate all that apply):

Pre		Post
X	laptop computer	X
X	desktop computer	X
	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	X
X	cellular phone	X
X	pager	X
X	fax machine	X
	camera (digital)	
	camera (film)	
	radio walkie-talkie	
	other (please specify):	

15. Which of the following electronic devices do you currently own? (indicate all that apply):

Pre		Post
	laptop computer	
	desktop computer	
	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	
	cellular phone	
	pager	
	fax machine	
	camera (digital)	
X	camera (film)	X
	radio walkie-talkie	
	other (please specify):	

16. Which of the following electronic devices have you owned previously but do not own any longer? (indicate all that apply):

Pre		Post
<input checked="" type="checkbox"/>	laptop computer	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	desktop computer	<input checked="" type="checkbox"/>
<input type="checkbox"/>	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	<input type="checkbox"/>
<input checked="" type="checkbox"/>	cellular phone	<input checked="" type="checkbox"/>
<input type="checkbox"/>	pager	<input type="checkbox"/>
<input type="checkbox"/>	fax machine	<input type="checkbox"/>
<input type="checkbox"/>	camera (digital)	<input type="checkbox"/>
<input checked="" type="checkbox"/>	camera (film)	<input checked="" type="checkbox"/>
<input type="checkbox"/>	radio walkie-talkie	<input type="checkbox"/>
<input type="checkbox"/>	other (please specify):	<input type="checkbox"/>

17. Why do you no longer use the devices you indicated above? (Please explain each individually - indicate all that apply):

Pre	Post
laptop desktop computer > cell phone	laptop was a 286 - don't need one no desktop decreased in PCS. Will eventually replace Had for several reasons: was stationed in South-Central LA (requiring). No longer need.

18. As you **conduct** a meeting or present a brief in your job, what materials do you prefer to use for your notes? (Indicate all applicable in the "USE" column and then rank these in order of preference in the "RANK" column - with 1 being your first choice):

Pre			Post	
USE	RANK	MEDIA FOR KEEPING MEETING NOTES	USE	RANK
X	1	note pad, notebook, loose sheets of paper	X	1
		scraps of paper (napkin, envelope, etc.)		
		index cards		
		date-timer or organizer (paper-based)		
		computerized presentation software (PowerPoint, Corel Presentations, Freelance Graphics, etc.)		
		electronic organizer (PDA, pocket organizer, etc.)		
		other (please specify):		
		other (please specify):		
		other (please specify):		

19. If an ideal device was available that could assist you in your job, what would it do? Please be specific. (Use as much space as you need including the back of this page if necessary):

Pre	Post
<p>How big or small is it?: <i>carry in pocket</i></p> <p>How do you enter data?: <i>voice</i></p> <p>Functions:</p> <ul style="list-style-type: none"> - scheduler / calendar - to-do list - address book - note-taker <p>How does it work with other devices?:</p> <p>- could synch w/ PC</p>	<p>How big or small is it?:</p> <p>How do you enter data?:</p> <p>Functions:</p> <p><i>Same</i></p> <p>How does it work with other devices?:</p>



20. Imagine that everybody your organization has the device you just described. How would that change your approach to meetings and routine job tasks?

Pre

Post

<p>Actually, what others here wouldn't change anything except if information (notes) could be transferred (as w/ the palmtop ability to perform transfer info).</p> <p>MAKE IT MORE EFFICIENT.</p> <p>PRESENTATIONS DIRECTLY FROM DEVICE</p> <p>DECREASE PREPARATION TIME</p>	<p>SAME.</p>
---	--------------

CLARIFICATION

PER PHONE CONVERSATION.

25 FEB 98

808



21. Imagine the following scenarios:

- a. You are passing a work associate in the passageway. She asks if you knew about a meeting scheduled for later in the week. You were not aware of the meeting. What do you do next? How do you plan to recall the meeting time and location? (Please use back of page if necessary):

Pre

Post

<p>write it down, pass it on to the secretary who will schedule it.</p>	<p>same <u>BUT</u></p> <p>am shopping for an electronic organizer I can carry with me so I could</p>
---	--

enter the info in the calendar on the PDA & set the alarm.

- b. While having lunch, you see someone you had known at a previous duty station. You ask for his phone number or address in order to stay in touch. What do you do next? How do you plan to record the phone number or address? (Please use back of page if necessary):

Pre

Post

write it on a napkin. copy it to (paper) phone book later.	Same, but plan to purchase a similar organizer. PALM TOP.
--	--

PER PHONE
CONVERSATION
25 FEB 98
RDS

- c. While in a Department Head meeting your Commanding Officer asks you for information that you do not have with you. You know this information is on your desktop computer and is easily available from any networked computer. There are network connections throughout the meeting room. What do you do next? How do you plan to retrieve the desired information? Would you be comfortable with getting up from the table to access one of the network connections? Why?

Pre

Post

I would go to the personal computer computer to retrieve the info - I would feel no discomfort because the network type who would object to it.	Same
--	------

- d. You have just been called to a meeting that is to start in a half hour. No other information regarding the meeting is available. What do you do next? What information and in what form do you prepare to take with you? (Please use back of page if necessary):

Pre

Post

paper notebook & Navy Leader Planning Guide (calendar)	Same PALM TOP - SOMEWHAT (WOULD BE BETTER IF OUTLOOK (PALM TOP), SYMMON 123, WZ 01 (GROUNTS) (DESKTOP))
--	---

PER PHONE
CONVERSATION
25 FEB 98
RDS

22. Please indicate all the following software applications you have used:

Pre		Post
<input checked="" type="checkbox"/>	Word Processor (Word Perfect, Ms Word, Word Pro, Clarisworks, Pagemaker Etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Spreadsheet (Excel, Lotus 1-2-3, Quattro Pro, ClarisWorks, etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Database (FoxPro, Access, Paradox, FileMaker, ClarisWorks, etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Calendar/Day-Timer (Lotus Organizer, MS Outlook, ACT!, Sidekick, etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Web Browser (Netscape, Internet Explorer, America Online, etc.)	<input checked="" type="checkbox"/>
	Presentation (PowerPoint, Corel Presentations, Freelance Graphics, Acrobat, etc.)	
<input checked="" type="checkbox"/>	Email (cc:Mail, America Online, MS Outlook, Netscape, Internet Explorer, etc.)	<input checked="" type="checkbox"/>
	Contact Management (Lotus Organizer, ACT!, Sidekick, etc.)	

23. Regarding my knowledge in computers, I consider myself to be:

Pre	KNOWLEDGEABLE	Post
	Very <u>U</u> nknowledgeable	
	Somewhat <u>U</u> nknowledgeable	
<input checked="" type="checkbox"/>	Somewhat Knowledgeable	<input checked="" type="checkbox"/>
	Knowledgeable	
	Very Knowledgeable	

24. Regarding my proficiency with computers, I consider myself to be:

Pre	PROFICIENCY	Post
	Very <u>N</u> on-proficient	
	Somewhat <u>N</u> on-proficient	
<input checked="" type="checkbox"/>	Somewhat Proficient	<input checked="" type="checkbox"/>
	Proficient	
	Very Proficient	

25. Regarding my comfort with using computers, I consider myself to be:

Pre	COMFORT	Post
	Very <u>U</u> ncomfortable	
	Somewhat <u>U</u> ncomfortable	
<input checked="" type="checkbox"/>	Somewhat Comfortable	<input checked="" type="checkbox"/>
	Comfortable	
	Very Comfortable	

Thank you for your time in completing this survey and for your participation in this project. The information you have provided will be very beneficial in this study of work activities. If you wish, results of this study will be made available to you by checking the block below.

☒ Please send me a copy of the results of this study.

SUBJECT #2

1. When you get to your office, what is the **first** piece of information you check? (Please indicate only one):

Pre		Post
<input checked="" type="checkbox"/>	daily schedule	<input checked="" type="checkbox"/>
<input type="checkbox"/>	"to do" list	<input type="checkbox"/>
<input type="checkbox"/>	voicemail and phone messages	<input type="checkbox"/>
<input type="checkbox"/>	plan of the day	<input type="checkbox"/>
<input type="checkbox"/>	email	<input type="checkbox"/>
<input type="checkbox"/>	headline news from newspapers	<input type="checkbox"/>
<input type="checkbox"/>	headline news from web sites	<input type="checkbox"/>
<input type="checkbox"/>	headline news from another source	<input type="checkbox"/>
<input type="checkbox"/>	other, please specify: _____	<input type="checkbox"/>

2. Please list and describe the **three** most important **job-related tasks** you do upon arriving at your office (Use as much space as you need, please feel free to use the back of this page if necessary):

Pre	Post
<p>- CHECK DAILY SCHEDULE (PAPER-BASED) <i>MS</i></p> <p>- CHECK AND RESPOND TO E-MAIL</p> <p>- MAKE INITIAL PHONE CALLS</p>	<p><u>SAME</u> (COMPUTER-BASED) <i>MS</i></p>

For questions 3 and 4 please indicate all items that you use in the "USE" column and rank them in order of importance, with **1 being most important** in the "RANK" column.

3. What types of **work-related** information do you need **immediate** access to throughout the typical work day? (indicate all that apply):

Pre			Post	
USE	RANK	ITEM	USE	RANK
<input checked="" type="checkbox"/>	3	daily schedule	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	2	"to do" list	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	6	address book	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	4	project documents	<input type="checkbox"/>	
<input type="checkbox"/>		news headlines	<input type="checkbox"/>	
<input type="checkbox"/>		financial reports	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	5	voicemail	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	1	email	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	7	world wide web browsing	<input type="checkbox"/>	
<input type="checkbox"/>		other (please specify): _____	<input type="checkbox"/>	

SAME

4. What types of **personal** information do you need **immediate** access to throughout the typical day? (indicate all that apply):

Pre			Post	
USE	RANK	ITEM	USE	RANK
✓	2	daily schedule	✓	2
✓	1	"to do" list	✓	1
✓	3	address book	✓	3
		project documents		
		news headlines		
		financial reports		
		voicemail		
		email		
		world wide web browsing		
		other (please specify):		

5. Please select **all** of the following **items** that you utilize regularly. Indicate if you maintain a resource for **work**-related and/or **personal** information, if they are in the **same** or **separate** objects and please list whether they are **paper-based** or are **automated** through your computer (desktop, laptop or PDA - do not indicate type of computer):

PRE:

Item	Work	Personal	Same	Separate	Paper-based	Automated
desktop calendar	✓	✓	✓		✓	
date/timer (scheduler)	✓	✓	✓		✓	
"to do" list	✓	✓	✓		✓	
post-it notes ("yellow stickies")	✓	✓	✓		✓	
financial records	✓			✓		✓
note pad	✓	✓		✓	✓	
other						
other						
other						

POST:

Item	Work	Personal	Same	Separate	Paper-based	Automated
desktop calendar						
date/timer (scheduler)						
"to do" list						
post-it notes ("yellow stickies")						
financial records						
note pad						
other						
other						
other						

Same

6. How do you remind yourself of what you need to do during the day?

Pre		Post
	I don't keep reminders	
✓	"to do" list on a paper-based planner	✓
	"to do" list on a desktop computer	✓
	"to do" list on an electronic organizer (Rex, Casio organizer, etc.)	
	"to do" list on a dry erase board or chalk board	
	post-it notes ("yellow stickies")	
	string around finger or rubber band around wrist	
	pocket voice recorder or message recording pen	
	other (please specify):	
	other (please specify):	
	other (please specify):	

7. What are the three most often used things on your desk?

Pre	Post
COMPUTER	} SAME
TELEPHONE	
CALENDAR	

8. How do you organize your work files? (choose the most applicable):

Pre		Post
	by project	
✓	by topic	✓
	by type	
	by date	
	other	

9. How often do you organize your work-related files? (choose the most applicable):

Pre		Post
	Once per day	✓
✓	a couple of times per week	
	once per week	
	a couple of times a month	
	once a month	
	hardly ever	
	never	
	other	

10. How do you organize your **personal** files? (choose the most applicable):

Pre		Post
	by project	
✓	by topic	✓
	by type	
	by date	
	other _____	

11. **How often** do you organize your **personal** files? (choose the most applicable):

Pre		Post
	once per day	✓
✓	a couple of times per week	
	once per week	
	a couple of times a month	
	once a month	
	hardly ever	
	never	
	other _____	

12. How do you communicate with people in job-related activities? (indicate **all that apply** in the "USE" column and then rank them in the "RANK" column with **1 being most important**):

Pre			Post	
USE	RANK	MEANS OF COMMUNICATION	USE	RANK
		video conferencing		
✓	1	email		
✓	3	pager/voicemail		
		telephone (cellular)		
✓	2	telephone (regular)		
		radio (walkie-talkie)		
✓	4	written notes		
		other (please specify): _____		

same

13. Which of the following electronic devices do you **currently** use **routinely** in your job? (indicate all that apply):

Pre		Post
	laptop computer	
✓	desktop computer	✓
	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	
	cellular phone	
	pager	
✓	fax machine	✓
	camera (digital)	
	camera (film)	
	radio walkie-talkie	
	other (please specify):	

14. Which of the following electronic devices **have you used** in your job? (present or past - indicate all that apply):

Pre		Post
✓	laptop computer	✓
✓	desktop computer	✓
✓	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	✓
	cellular phone	
	pager	✓
✓	fax machine	✓
✓	camera (digital)	✓
	camera (film)	
✓	radio walkie-talkie	✓
	other (please specify):	

15. Which of the following electronic devices do you **currently** own? (indicate all that apply):

Pre		Post
	laptop computer	
✓	desktop computer	✓
	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	
	cellular phone	
	pager	
✓	fax machine	✓
	camera (digital)	
✓	camera (film)	✓
	radio walkie-talkie	
	other (please specify):	

16. Which of the following electronic devices have you owned previously but do not own any longer? (indicate all that apply):

Pre		Post
	laptop computer	
✓	desktop computer	✓
✓	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	✓
	cellular phone	
	pager	
✓	fax machine	✓
	camera (digital)	
✓	camera (film)	✓
✓	radio walkie-talkie	✓
	other (please specify):	

17. Why do you no longer use the devices you indicated above? (Please explain each individually - indicate all that apply):

Pre	Post
<p>- PDA: KEPT LOOSING DATA/UN-RELIABLE</p> <p>- RADIO WALKIE-TALKIE: NO LONGER NEEDED</p>	<p>(same)</p>

18. As you **conduct** a meeting or present a brief in your job, what materials do you prefer to use for your notes? (Indicate all applicable in the "USE" column and then rank these in order of preference in the "RANK" column - with 1 being your first choice):

Pre			Post	
USE	RANK	MEDIA FOR KEEPING MEETING NOTES	USE	RANK
X	1	note pad, notebook, loose sheets of paper	X	1
		scraps of paper (napkin, envelope, etc.)		
		index cards		
		date-timer or organizer (paper-based)		
X	2	computerized presentation software (PowerPoint, Corel Presentations, Freelance Graphics, etc.)	X	2
		electronic organizer (PDA, pocket organizer, etc.)		
		other (please specify):		
		other (please specify):		
		other (please specify):		

19. If an ideal device was available that could assist you in your job, what would it do? Please be specific. (Use as much space as you need including the back of this page if necessary):

Pre	Post
<p>How big or small is it?: CREDIT CARD SIZE</p> <p>How do you enter data?: BY VOICE / CAMERA</p> <p>Functions:</p> <ul style="list-style-type: none"> - WP - SPREADSHEET - DATABASE - IMAGE DISPLAY (PHOTOS) - INTERNET ACCESS - E-MAIL ACCESS <p>How does it work with other devices?:</p> <p>- WIRELESS / INSTANT ACCESS</p>	<p>How big or small is it?:</p> <p>How do you enter data?:</p> <p>Functions:</p> <p><i>SAME</i></p> <p>How does it work with other devices?:</p>

20. Imagine that everybody ^{IN} your organization has the device you just described. How would that change your approach to meetings and routine job tasks?

Pre

Post

<ul style="list-style-type: none"> - SAVES TIME BY VOICE RECOGNITION - NOTE TAKING BY VOICE INPUT - WIRELESS/INSTANT COMMUNICATION 	<p>SAME:</p> <p>-- VOICE TO TEXT OPTION</p>
---	---

21. Imagine the following scenarios:

- a. You are passing a work associate in the passageway. She asks if you knew about a meeting scheduled for later in the week. You were not aware of the meeting. What do you do next? How do you plan to recall the meeting time and location? (Please use back of page if necessary):

Pre

Post

<p>- WRITE THE MEETING TIME AND PLACE IN MY NOTEBOOK CALENDAR WHEN I RETURN TO MY OFFICE.</p>	<p>SAME: EXCEPT NOW ENTER IN PC ELECTRONIC CALENDAR (DESKTOP)</p>
---	---

- b. While having lunch, you see someone you had known at a previous duty station. You ask for his phone number or address in order to stay in touch. What do you do next? How do you plan to record the phone number or address? (Please use back of page if necessary):

Pre

Post

<p>- WRITE IT DOWN ON A PIECE OF PAPER -- TRANSFER IT TO MY PAPER-BASED ADDRESS BOOK WHEN I RETURN TO MY OFFICE.</p>	<p><u>SAME</u></p>
--	--------------------

- c. While in a Department Head meeting your Commanding Officer asks you for information that you do not have with you. You know this information is on your desktop computer and is easily available from any networked computer. There are network connections throughout the meeting room. What do you do next? How do you plan to retrieve the desired information? Would you be comfortable with getting up from the table to access one of the network connections? Why?

Pre

Post

<p>- TELL THE C.O. "I'LL GET BACK WITH YOU!" ☺ - MOST "FOREIGN" COMPUTERS SEEM TO BLOCK ME OUT OF MY OWN FILES -- WASTING MY TIME.</p>	<p><u>SAME</u></p>
--	--------------------

- d. You have just been called to a meeting that is to start in a half hour. No other information regarding the meeting is available. What do you do next? What information and in what form do you prepare to take with you? (Please use back of page if necessary):

Pre

Post

<p>- MAKE ADDITIONAL PHONE CALLS TO DETERMINE MEETING TOPIC - TAKE CALENDAR, PHONE POLS, MEETING NOTEBOOK.</p>	<p><u>SAME</u></p>
--	--------------------

22. Please indicate all the following software applications you have used:

Pre		Post
<input checked="" type="checkbox"/>	Word Processor (Word Perfect , Ms Word , Word Pro , Clarisworks , Pagemaker Etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Spreadsheet (Excel , Lotus 1-2-3 , Quattro Pro , ClarisWorks , etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Database (FoxPro , Access , Paradox , FileMaker , ClarisWorks , etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Calendar/Day-Timer (Lotus Organizer , MS Outlook , ACT! , Sidekick , etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Web Browser (Netscape , Internet Explorer , America Online , etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Presentation (PowerPoint , Corel Presentations , Freelance Graphics , Acrobat , etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Email (cc:Mail , America Online , MS Outlook , Netscape , Internet Explorer , etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Contact Management (Lotus Organizer , ACT! , Sidekick , etc.)	<input checked="" type="checkbox"/>

23. Regarding my knowledge in computers, I consider myself to be:

Pre	KNOWLEDGEABLE	Post
	Very <u>Un</u> knowledgeable	
	Somewhat <u>Un</u> knowledgeable	
	Somewhat Knowledgeable	
<input checked="" type="checkbox"/>	Knowledgeable	<input checked="" type="checkbox"/>
	Very Knowledgeable	

24. Regarding my proficiency with computers, I consider myself to be:

Pre	PROFICIENCY	Post
	Very <u>Non</u> -proficient	
	Somewhat <u>Non</u> -proficient	
	Somewhat Proficient	
<input checked="" type="checkbox"/>	Proficient	<input checked="" type="checkbox"/>
	Very Proficient	

25. Regarding my comfort with using computers, I consider myself to be:

Pre	COMFORT	Post
	Very <u>Un</u> comfortable	
	Somewhat <u>Un</u> comfortable	
	Somewhat Comfortable	
	Comfortable	
<input checked="" type="checkbox"/>	Very Comfortable	<input checked="" type="checkbox"/>

Thank you for your time in completing this survey and for your participation in this project. The information you have provided will be very beneficial in this study of work activities. If you wish, results of this study will be made available to you by checking the block below.

☒ Please send me a copy of the results of this study.

SUBJECT #3

1. When you get to your office, what is the **first** piece of information you check? (Please indicate only one):

Pre			Post
	<input checked="" type="checkbox"/>	daily schedule	
	<input checked="" type="checkbox"/>	"to do" list	
	<input type="checkbox"/>	voicemail and phone messages	
	<input checked="" type="checkbox"/>	plan of the day	
	<input checked="" type="checkbox"/>	email	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	headline news from newspapers	
	<input type="checkbox"/>	headline news from web sites	
	<input type="checkbox"/>	headline news from another source	
	<input type="checkbox"/>	other, please specify:	

2. Please list and describe the **three** most important **job-related tasks** you do upon arriving at your office (Use as much space as you need, please feel free to use the back of this page if necessary):

Pre		Post
	Check e-mail review in box Check action items	Check email review traffic. make to do list

For questions 3 and 4 please indicate all items that you use in the "USE" column and rank them in order of importance, with **1 being most important** in the "RANK" column.

3. What types of **work-related** information do you need **immediate** access to throughout the typical work day? (indicate all that apply):

Pre			Post	
USE	RANK	ITEM	USE	RANK
3	—	daily schedule	✓	3
2	—	"to do" list	✓	2
5	—	address book		
4	—	project documents		
		news headlines		
		financial reports		
		voicemail		
1	—	email	✓	1
		world wide web browsing		
		other (please specify):		

4. What types of **personal** information do you need **immediate** access to throughout the typical day? (indicate all that apply):

Pre			Post	
USE	RANK	ITEM	USE	RANK
✓	2	daily schedule	✓	3
✓	3	"to do" list	✓	2
✓	4	address book	✓	4
		project documents		
✓		news headlines		
✓	5	financial reports	✓	5
✓		voicemail		
✓	1	email	✓	1
		world wide web browsing		
		other (please specify):		

5. Please select **all** of the following **items** that you utilize regularly. Indicate if you maintain a resource for **work**-related and/or **personal** information, if they are in the **same** or **separate** objects and please list whether they are **paper-based** or are **automated** through your computer (desktop, laptop or PDA - do not indicate type of computer):

PRE:

Item	Work	Personal	Same	Separate	Paper-based	Automated
desktop calendar	✓	✓		✓	✓	✓
date/timer (scheduler)	✓	✓		✓	✓	✓
"to do" list	✓	✓		✓	✓	✓
post-it notes ("yellow stickies")	✓	✓		✓	✓	✓
financial records	✓	✓		✓	✓	✓
note pad	✓	✓		✓	✓	✓
other						
other						
other						

POST:

Item	Work	Personal	Same	Separate	Paper-based	Automated
desktop calendar	✓					
date/timer (scheduler)						
"to do" list						
post-it notes ("yellow stickies")						
financial records						
note pad						
other						
other						
other						

6. How do you remind yourself of what you need to do during the day?

Pre		Post
<input checked="" type="checkbox"/>	I don't keep reminders	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	"to do" list on a paper-based planner	<input checked="" type="checkbox"/>
<input type="checkbox"/>	"to do" list on a desktop computer	<input type="checkbox"/>
<input type="checkbox"/>	"to do" list on an electronic organizer (Rex, Casio organizer, etc.)	<input type="checkbox"/>
<input type="checkbox"/>	"to do" list on a dry erase board or chalk board	<input type="checkbox"/>
<input type="checkbox"/>	post-it notes ("yellow stickies")	<input type="checkbox"/>
<input type="checkbox"/>	string around finger or rubber band around wrist	<input type="checkbox"/>
<input type="checkbox"/>	pocket voice recorder or message recording pen	<input type="checkbox"/>
<input type="checkbox"/>	other (please specify):	<input type="checkbox"/>
<input type="checkbox"/>	other (please specify):	<input type="checkbox"/>
<input type="checkbox"/>	other (please specify):	<input type="checkbox"/>

7. What are the three most often used things on your desk?

Pre		Post
	Calendar	Calendar
	Phone	Phone
	Computer	Computer

8. How do you organize your work files? (choose the most applicable):

Pre		Post
<input checked="" type="checkbox"/>	by project	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	by topic	<input checked="" type="checkbox"/>
<input type="checkbox"/>	by type	<input type="checkbox"/>
<input type="checkbox"/>	by date	<input type="checkbox"/>
<input type="checkbox"/>	other	<input type="checkbox"/>

9. How often do you organize your work-related files? (choose the most applicable):

Pre		Post
<input type="checkbox"/>	Once per day	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	a couple of times per week	<input checked="" type="checkbox"/>
<input type="checkbox"/>	once per week	<input type="checkbox"/>
<input type="checkbox"/>	a couple of times a month	<input type="checkbox"/>
<input type="checkbox"/>	once a month	<input type="checkbox"/>
<input type="checkbox"/>	hardly ever	<input type="checkbox"/>
<input type="checkbox"/>	never	<input type="checkbox"/>
<input type="checkbox"/>	other	<input type="checkbox"/>

10. How do you organize your **personal** files? (choose the most applicable):

Pre		Post
	by project	
✓	by topic	✓
	by type	
	by date	
	other	

11. **How often** do you organize your **personal** files? (choose the most applicable):

Pre		Post
	once per day	
	a couple of times per week	
	once per week	
✓	a couple of times a month	✓
	once a month	
	hardly ever	
	never	
	other	

12. How do you communicate with people in job-related activities? (indicate **all that apply** in the "USE" column and then rank them in the "RANK" column with **1 being most important**):

Pre			Post	
USE	RANK	MEANS OF COMMUNICATION	USE	RANK
✓	4	video conferencing	✓	4
✓	1	email	✓	1
		pager/voicemail		
		telephone (cellular)		
✓	2	telephone (regular)	✓	2
		radio (walkie-talkie)		
✓	3	written notes	✓	3
		other (please specify):		

13. Which of the following electronic devices do you currently use routinely in your job? (indicate all that apply):

Pre		Post
	<input checked="" type="checkbox"/> laptop computer	
	<input checked="" type="checkbox"/> desktop computer	<input checked="" type="checkbox"/>
	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	
	cellular phone	
	pager	
	<input checked="" type="checkbox"/> fax machine	<input checked="" type="checkbox"/>
	camera (digital)	
	camera (film)	
	radio walkie-talkie	
	other (please specify):	

14. Which of the following electronic devices have you used in your job? (present or past - indicate all that apply):

Pre		Post
	<input checked="" type="checkbox"/> laptop computer	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/> desktop computer	<input checked="" type="checkbox"/>
	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	
	cellular phone	
	pager	
	<input checked="" type="checkbox"/> fax machine	<input checked="" type="checkbox"/>
	camera (digital)	
	camera (film)	
	radio walkie-talkie	
	other (please specify):	

15. Which of the following electronic devices do you currently own? (indicate all that apply):

Pre		Post
	<input checked="" type="checkbox"/> laptop computer	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/> desktop computer	<input checked="" type="checkbox"/>
	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	
	cellular phone	
	pager	
	<input checked="" type="checkbox"/> fax machine	<input checked="" type="checkbox"/>
	camera (digital)	
	<input checked="" type="checkbox"/> camera (film)	<input checked="" type="checkbox"/>
	radio walkie-talkie	
	other (please specify):	

16. Which of the following electronic devices have you owned previously but do not own any longer? (indicate all that apply):

Pre		Post
	laptop computer	
	desktop computer	
	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	
✓	cellular phone	✓
✓	pager	✓
	fax machine	
	camera (digital)	
	camera (film)	
	radio walkie-talkie	
	other (please specify):	

17. Why do you no longer use the devices you indicated above? (Please explain each individually - indicate all that apply):

Pre	Post
Bulky, expensive, nuisance.	Too large/bulky/heavy. Too many functions Too expensive

18. As you **conduct** a meeting or present a brief in your job, what materials do you prefer to use for your notes? (Indicate all applicable in the "USE" column and then rank these in order of preference in the "RANK" column - with 1 being your first choice):

Pre		MEDIA FOR KEEPING MEETING NOTES	Post	
USE	RANK		USE	RANK
✓	3	note pad, notebook, loose sheets of paper	✓	3
✓		scraps of paper (napkin, envelope, etc.)		
✓		index cards		
✓	2	date-timer or organizer (paper-based)	✓	2
✓	1	computerized presentation software (PowerPoint, Corel Presentations, Freelance Graphics, etc.)	✓	1
✓	4	electronic organizer (PDA, pocket organizer, etc.)	✓	4
		other (please specify):		
		other (please specify):		
		other (please specify):		

19. If an ideal device was available that could assist you in your job, what would it do? Please be specific. (Use as much space as you need including the back of this page if necessary):

Pre	Post
<p>How big or small is it?: <i>Small</i></p> <p>How do you enter data?: <i>Writing</i></p> <p>Functions:</p> <p><i>Calendar</i></p> <p><i>Notes</i></p> <p><i>Calculator</i></p> <p><i>Address/Contacts</i></p> <p>How does it work with other devices?:</p> <p><i>Doesn't need to</i></p>	<p>How big or small is it?:</p> <p>How do you enter data?:</p> <p>Functions:</p> <p><i>Phone</i></p> <p>How does it work with other devices?:</p>

20. Imagine that everybody your organization has the device you just described. How would that change your approach to meetings and routine job tasks?

Pre

Post

<p>Promptness End meeting on time Alert to important functions</p>	<p>Done</p>
--	-------------

21. Imagine the following scenarios:

- a. You are passing a work associate in the passageway. She asks if you knew about a meeting scheduled for later in the week. You were not aware of the meeting. What do you do next? How do you plan to recall the meeting time and location? (Please use back of page if necessary):

Pre

Post

<p>Wheel through notes, scramble to coordinate try to find a calendar</p>	<p>Done</p>
---	-------------

- b. While having lunch, you see someone you had known at a previous duty station. You ask for his phone number or address in order to stay in touch. What do you do next? How do you plan to record the phone number or address? (Please use back of page if necessary):

Pre

Post

<p>Got it down, transfer it to address device (electronic)</p>	<p>Same</p>
--	-------------

- c. While in a Department Head meeting your Commanding Officer asks you for information that you do not have with you. You know this information is on your desktop computer and is easily available from any networked computer. There are network connections throughout the meeting room. What do you do next? How do you plan to retrieve the desired information? Would you be comfortable with getting up from the table to access one of the network connections? Why?

Pre

Post

<p>Jump on computer, log in remotely, access file. Yes I would feel comfortable.</p>	<p>Same</p>
--	-------------

- d. You have just been called to a meeting that is to start in a half hour. No other information regarding the meeting is available. What do you do next? What information and in what form do you prepare to take with you? (Please use back of page if necessary):

Pre

Post

<p>Attend meeting. Deal w/ it then. If they are so unprepared about mty, how do they expect you to be?</p>	<p>Same</p>
--	-------------

22. Please indicate all the following software applications you have used:

Pre		Post
<input checked="" type="checkbox"/>	Word Processor (Word Perfect, Ms Word, Word Pro, Clarisworks, Pagemaker Etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Spreadsheet (Excel, Lotus 1-2-3, Quattro Pro, ClarisWorks, etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Database (FoxPro, Access, Paradox, FileMaker, ClarisWorks, etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Calendar/Day-Timer (Lotus Organizer, MS Outlook, ACT!, Sidekick, etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Web Browser (Netscape, Internet Explorer, America Online, etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Presentation (PowerPoint, Corel Presentations, Freelance Graphics, Acrobat, etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Email (cc:Mail, America Online, MS Outlook, Netscape, Internet Explorer, etc.)	<input checked="" type="checkbox"/>
	Contact Management (Lotus Organizer, ACT!, Sidekick, etc.)	

23. Regarding my knowledge in computers, I consider myself to be:

Pre	KNOWLEDGEABLE	Post
<input checked="" type="checkbox"/>	Very <u>Un</u> knowledgeable	
<input checked="" type="checkbox"/>	Somewhat <u>Un</u> knowledgeable	
<input checked="" type="checkbox"/>	Somewhat Knowledgeable	<input checked="" type="checkbox"/>
	Knowledgeable	
	Very Knowledgeable	

24. Regarding my proficiency with computers, I consider myself to be:

Pre	PROFICIENCY	Post
	Very <u>Non</u> -proficient	
	Somewhat <u>Non</u> -proficient	
<input checked="" type="checkbox"/>	Somewhat Proficient	<input checked="" type="checkbox"/>
	Proficient	
	Very Proficient	

25. Regarding my comfort with using computers, I consider myself to be:

Pre	COMFORT	Post
	Very <u>Un</u> comfortable	
	Somewhat <u>Un</u> comfortable	
	Somewhat Comfortable	
<input checked="" type="checkbox"/>	Comfortable	<input checked="" type="checkbox"/>
	Very Comfortable	

Thank you for your time in completing this survey and for your participation in this project. The information you have provided will be very beneficial in this study of work activities. If you wish, results of this study will be made available to you by checking the block below.

☒ Please send me a copy of the results of this study.

SUBJECT #4

1. When you get to your office, what is the **first** piece of information you check? (Please indicate only one):

Pre	Post
<input type="checkbox"/>	daily schedule
<input type="checkbox"/>	"to do" list
<input type="checkbox"/>	voicemail and phone messages
<input type="checkbox"/>	plan of the day
<input checked="" type="checkbox"/>	email
<input type="checkbox"/>	headline news from newspapers
<input type="checkbox"/>	headline news from web sites
<input type="checkbox"/>	headline news from another source
<input type="checkbox"/>	other, please specify:

2. Please list and describe the **three** most important **job-related tasks** you do upon arriving at your office (Use as much space as you need, please feel free to use the back of this page if necessary):

Pre	Post
✓ e mail ✓ voice mail ✓ write down tasks for day	✓ schedule ✓ e mail ✓ voicemail

For questions 3 and 4 please indicate all items that you use in the "USE" column and rank them in order of importance, with **1 being most important** in the "RANK" column.

3. What types of **work-related** information do you need **immediate** access to throughout the typical work day? (indicate all that apply):

Pre			Post		
USE	RANK	ITEM	USE	RANK	
✓	4	daily schedule	✓	1	
✓	3	"to do" list	✓	2	
✓	5	address book	✓	7	
✓	6	project documents	✓	6	
		news headlines			
✓	8	financial reports	✓	8	
✓	2	voicemail	✓	3	
✓	1	email	✓	4	
✓	7	world wide web browsing	✓	5	
		other (please specify):			

4. What types of **personal** information do you need **immediate** access to throughout the typical day? (indicate all that apply):

Pre			Post		
USE	RANK	ITEM	USE	RANK	
✓	4	daily schedule	✓	1	
		"to do" list			
✓	5	address book	✓	2	
		project documents			
		news headlines			
		financial reports			
✓	2	voicemail	✓	4	
✓	1	email	✓	3	
✓	3	world wide web browsing	✓	5	
		other (please specify):			

5. Please select **all** of the following **items** that you utilize regularly. Indicate if you maintain a resource for **work**-related and/or **personal** information, if they are in the **same** or **separate** objects and please list whether they are **paper-based** or are **automated** through your computer (desktop, laptop or PDA - do not indicate type of computer):

PRE:

Item	Work	Personal	Same	Separate	Paper-based	Automated
desktop calendar	X	X		X		X
date/timer (scheduler)	X	X		X	X	
"to do" list	X	X		X	X	X
post-it notes ("yellow stickies")	X			X	X	
financial records		X		X	X	X
note pad	X	X		X	X	
other						
other						
other						

POST:

Item	Work	Personal	Same	Separate	Paper-based	Automated
desktop calendar	X	X		X	X	X
date/timer (scheduler)	X			X		X
"to do" list	X	X		X	X	X
post-it notes ("yellow stickies")	X			X	X	
financial records	X	X		X		X
note pad	X			X	X	X
other						
other						
other						

6. How do you remind yourself of what you need to do during the day?

Pre		Post
	I don't keep reminders	
	"to do" list on a paper-based planner	
	"to do" list on a desktop computer	
	"to do" list on an electronic organizer (Rex, Casio organizer, etc.)	✓
	"to do" list on a dry erase board or chalk board	
X	post-it notes ("yellow stickies")	✓
	string around finger or rubber band around wrist	
	pocket voice recorder or message recording pen	
	other (please specify):	
	other (please specify):	
	other (please specify):	

7. What are the three most often used things on your desk?

Pre	Post
Pen	Computer
Computer	Pen
Post it notes	PDA

8. How do you organize your work files? (choose the most applicable):

Pre		Post
	by project	
X	by topic	X
	by type	
	by date	X
	other	

9. How often do you organize your work-related files? (choose the most applicable):

Pre		Post
	Once per day	
X	a couple of times per week	X
	once per week	
	a couple of times a month	
	once a month	
	hardly ever	
	never	
	other	

10. How do you organize your **personal** files? (choose the most applicable):

Pre		Post
<input checked="" type="checkbox"/>	by project	<input checked="" type="checkbox"/>
<input type="checkbox"/>	by topic	<input type="checkbox"/>
<input type="checkbox"/>	by type	<input type="checkbox"/>
<input type="checkbox"/>	by date	<input type="checkbox"/>
<input type="checkbox"/>	other	<input type="checkbox"/>

11. **How often** do you organize your **personal** files? (choose the most applicable):

Pre		Post
<input type="checkbox"/>	once per day	<input type="checkbox"/>
<input checked="" type="checkbox"/>	a couple of times per week	<input checked="" type="checkbox"/>
<input type="checkbox"/>	once per week	<input type="checkbox"/>
<input type="checkbox"/>	a couple of times a month	<input type="checkbox"/>
<input type="checkbox"/>	once a month	<input type="checkbox"/>
<input type="checkbox"/>	hardly ever	<input type="checkbox"/>
<input type="checkbox"/>	never	<input type="checkbox"/>
<input type="checkbox"/>	other	<input type="checkbox"/>

12. How do you communicate with people in job-related activities? (indicate **all that apply** in the "USE" column and then rank them in the "RANK" column with **1 being most important**):

Pre			Post	
USE	RANK	MEANS OF COMMUNICATION	USE	RANK
<input checked="" type="checkbox"/>		video conferencing	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	1	email	<input checked="" type="checkbox"/>	1
<input checked="" type="checkbox"/>	2	pager/voicemail	<input checked="" type="checkbox"/>	3
<input checked="" type="checkbox"/>	5	telephone (cellular)	<input checked="" type="checkbox"/>	4
<input checked="" type="checkbox"/>	3	telephone (regular)	<input checked="" type="checkbox"/>	2
		radio (walkie-talkie)		
<input checked="" type="checkbox"/>	4	written notes	<input checked="" type="checkbox"/>	5
		other (please specify):		

13. Which of the following electronic devices do you **currently** use **routinely** in your job? (indicate all that apply):

Pre		Post
<input type="checkbox"/>	laptop computer	<input type="checkbox"/>
<input checked="" type="checkbox"/>	desktop computer	<input checked="" type="checkbox"/>
<input type="checkbox"/>	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	<input checked="" type="checkbox"/>
<input type="checkbox"/>	cellular phone	<input type="checkbox"/>
<input checked="" type="checkbox"/>	pager	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	fax machine	<input checked="" type="checkbox"/>
<input type="checkbox"/>	camera (digital)	<input type="checkbox"/>
<input type="checkbox"/>	camera (film)	<input type="checkbox"/>
<input type="checkbox"/>	radio walkie-talkie	<input type="checkbox"/>
<input type="checkbox"/>	other (please specify):	<input type="checkbox"/>

14. Which of the following electronic devices **have you used** in your job? (present or past - indicate all that apply):

Pre		Post
<input checked="" type="checkbox"/>	laptop computer	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	desktop computer	<input checked="" type="checkbox"/>
<input type="checkbox"/>	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	cellular phone	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	pager	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	fax machine	<input checked="" type="checkbox"/>
<input type="checkbox"/>	camera (digital)	<input type="checkbox"/>
<input checked="" type="checkbox"/>	camera (film)	<input checked="" type="checkbox"/>
<input type="checkbox"/>	radio walkie-talkie	<input type="checkbox"/>
<input type="checkbox"/>	other (please specify):	<input type="checkbox"/>

15. Which of the following electronic devices do you **currently** own? (indicate all that apply):

Pre		Post
<input type="checkbox"/>	laptop computer	<input type="checkbox"/>
<input checked="" type="checkbox"/>	desktop computer	<input checked="" type="checkbox"/>
<input type="checkbox"/>	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	<input type="checkbox"/>
<input checked="" type="checkbox"/>	cellular phone	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	pager	<input checked="" type="checkbox"/>
<input type="checkbox"/>	fax machine	<input type="checkbox"/>
<input type="checkbox"/>	camera (digital)	<input type="checkbox"/>
<input checked="" type="checkbox"/>	camera (film)	<input checked="" type="checkbox"/>
<input type="checkbox"/>	radio walkie-talkie	<input type="checkbox"/>
<input checked="" type="checkbox"/>	other (please specify): Casio BOSS Organizer	<input checked="" type="checkbox"/>

16. Which of the following electronic devices have you owned previously but do not own any longer? (indicate all that apply):

Pre		Post
<input type="checkbox"/>	laptop computer	<input type="checkbox"/>
<input type="checkbox"/>	desktop computer	<input type="checkbox"/>
<input type="checkbox"/>	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	<input type="checkbox"/>
<input type="checkbox"/>	cellular phone	<input type="checkbox"/>
<input type="checkbox"/>	pager	<input type="checkbox"/>
<input type="checkbox"/>	fax machine	<input type="checkbox"/>
<input type="checkbox"/>	camera (digital)	<input type="checkbox"/>
<input type="checkbox"/>	camera (film)	<input type="checkbox"/>
<input type="checkbox"/>	radio walkie-talkie	<input type="checkbox"/>
<input checked="" type="checkbox"/>	other (please specify): <u>camcorder</u>	<input checked="" type="checkbox"/>

17. Why do you no longer use the devices you indicated above? (Please explain each individually - indicate all that apply):

Pre	Post
Stolen.	STOLEN

18. As you **conduct** a meeting or present a brief in your job, what materials do you prefer to use for your notes? (Indicate all applicable in the "USE" column and then rank these in order of preference in the "RANK" column - with 1 being your first choice):

Pre			Post	
USE	RANK	MEDIA FOR KEEPING MEETING NOTES	USE	RANK
✓	3	note pad, notebook, loose sheets of paper	2	
		scraps of paper (napkin, envelope, etc.)		
		index cards		
		date-timer or organizer (paper-based)		
✓	1	computerized presentation software (PowerPoint, Corel Presentations, Freelance Graphics, etc.)	3	
✓	2	electronic organizer (PDA, pocket organizer, etc.)	1	
		other (please specify):		
		other (please specify):		
		other (please specify):		

19. If an ideal device was available that could assist you in your job, what would it do? Please be specific. (Use as much space as you need including the back of this page if necessary):

Pre	Post
<p>How big or small is it?: Pocket sized</p> <p>How do you enter data?: Standard keyboard</p> <p>Functions: email voice mail spread sheets graphs Printing word processing</p> <p>How does it work with other devices?: either by dial up (cell) or simple cable connection</p>	<p>How big or small is it?: Pocket sized</p> <p>How do you enter data?: Standard kybd and handwritten</p> <p>Functions: Calendar Scheduler Task manager note pad IR link Word processing conversion</p> <p>How does it work with other devices?: Dial up, IR Link, Cable.</p>

20. Imagine that everybody ^{IN} your organization has the device you just described. How would that change your approach to meetings and routine job tasks?

Pre

Post

<p>Information needed for meetings could be retrieved on the spot & shared with the others without cumbersome paper to carry around</p>	<p>Info can be disseminated paperless. Still need to be organized to work properly.</p>
---	---

21. Imagine the following scenarios:

- a. You are passing a work associate in the passageway. She asks if you knew about a meeting scheduled for later in the week. You were not aware of the meeting. What do you do next? How do you plan to recall the meeting time and location? (Please use back of page if necessary):

Pre

Post

<p>Write on piece of paper or ask her to email me with the meeting specs. If that doesn't work, I write the items on a scrap piece of paper or my hand.</p>	<p>Ask her to email me the specs. If we had ideal PDA's, she could IR info to me in hallway.</p>
---	--

- b. While having lunch, you see someone you had known at a previous duty station. You ask for his phone number or address in order to stay in touch. What do you do next? How do you plan to record the phone number or address? (Please use back of page if necessary):

Pre

Post

Write on scrap paper or on hand	Write in organizer (PDA) on spot
------------------------------------	-------------------------------------

- c. While in a Department Head meeting your Commanding Officer asks you for information that you do not have with you. You know this information is on your desktop computer and is easily available from any networked computer. There are network connections throughout the meeting room. What do you do next? How do you plan to retrieve the desired information? Would you be comfortable with getting up from the table to access one of the network connections? Why?

Pre

Post

I would inform CO that I have the info on my machine and that I can access the information in the CS soon as I return to my desk (no computers in room). If PC is available	DITTO!! Access Immediately <i>THS</i>
--	--

- d. You have just been called to a meeting that is to start in a half hour. No other information regarding the meeting is available. What do you do next? What information and in what form do you prepare to take with you? (Please use back of page if necessary):

Pre

Post

I'd take a note pad & Pen. I'd also call around to find out the meeting topic.	Take: Pen/Pad/PDA (if I have one). call around to determine meeting topics
---	--

22. Please indicate all the following software applications you have used:

Pre		Post
<input checked="" type="checkbox"/>	Word Processor (Word Perfect, Ms Word, Word Pro, Clarisworks, Pagemaker Etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Spreadsheet (Excel, Lotus 1-2-3, Quattro Pro, ClarisWorks, etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Database (FoxPro, Access, Paradox, FileMaker, ClarisWorks, etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Calendar/Day-Timer (Lotus Organizer, MS Outlook, ACT!, Sidekick, etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Web Browser (Netscape, Internet Explorer, America Online, etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Presentation (PowerPoint, Corel Presentations, Freelance Graphics, Acrobat, etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Email (cc:Mail, America Online, MS Outlook, Netscape, Internet Explorer, etc.)	<input checked="" type="checkbox"/>
	Contact Management (Lotus Organizer, ACT!, Sidekick, etc.)	

23. Regarding my knowledge in computers, I consider myself to be:

Pre	KNOWLEDGEABLE	Post
	Very <u>Un</u> knowledgeable	
	Somewhat <u>Un</u> knowledgeable	
	Somewhat Knowledgeable	
<input checked="" type="checkbox"/>	Knowledgeable	<input checked="" type="checkbox"/>
	Very Knowledgeable	

24. Regarding my proficiency with computers, I consider myself to be:

Pre	PROFICIENCY	Post
	Very <u>Non</u> -proficient	
	Somewhat <u>Non</u> -proficient	
	Somewhat Proficient	
	Proficient	
<input checked="" type="checkbox"/>	Very Proficient	<input checked="" type="checkbox"/>

25. Regarding my comfort with using computers, I consider myself to be:

Pre	COMFORT	Post
	Very <u>Un</u> comfortable	
	Somewhat <u>Un</u> comfortable	
	Somewhat Comfortable	
	Comfortable	
<input checked="" type="checkbox"/>	Very Comfortable	<input checked="" type="checkbox"/>

Thank you for your time in completing this survey and for your participation in this project. The information you have provided will be very beneficial in this study of work activities. If you wish, results of this study will be made available to you by checking the block below.

☒ Please send me a copy of the results of this study.

SUBJECT #5

1. When you get to your office, what is the **first** piece of information you check? (Please indicate only one):

Pre		Post
	daily schedule	
	"to do" list	
	voicemail and phone messages	
	plan of the day	
X	email	X
	headline news from newspapers	
	headline news from web sites	
	headline news from another source	
	other, please specify:	

2. Please list and describe the **three** most important **job-related tasks** you do upon arriving at your office (Use as much space as you need, please feel free to use the back of this page if necessary):

Pre	Post
<p>PRIORITIZING CURRENT AND FUTURE TASKS</p> <p>- RESPONDING TO E-MAIL AND PHONE MESSAGES</p> <p>- ORGANIZING AND PRESENTING INFORMATION IN AN UNDERSTANDABLE AND USEABLE FORMAT.</p>	<p>SAME AS PRE</p>

For questions 3 and 4 please indicate all items that you use in the "USE" column and rank them in order of importance, with **1 being most important** in the "RANK" column.

3. What types of **work-related** information do you need **immediate** access to throughout the typical work day? (indicate all that apply):

Pre			Post	
USE	RANK	ITEM	USE	RANK
X	2	daily schedule	1	X
X	1	"to do" list	3	X
		address book		
X	4	project documents	5	X
		news headlines		
X	5	financial reports	4	X
		voicemail		
X	3	email	2	X
		world wide web browsing		
		other (please specify):		

4. What types of **personal** information do you need **immediate** access to throughout the typical day? (indicate all that apply):

Pre			Post	
USE	RANK	ITEM	USE	RANK
X	2	daily schedule	1	X
X	1	"to do" list	3	X
X	4	address book	4	X
		project documents		
		news headlines		
		financial reports		
		voicemail		
X	3	email	2	X
		world wide web browsing		
		other (please specify):		

5. Please select **all** of the following **items** that you utilize regularly. Indicate if you maintain a resource for **work**-related and/or **personal** information, if they are in the **same** or **separate** objects and please list whether they are **paper-based** or are **automated** through your computer (desktop, laptop or PDA - do not indicate type of computer):

PRE:

Item	Work	Personal	Same	Separate	Paper-based	Automated
desktop calendar						
date/timer (scheduler)	X	X	X		X	
"to do" list	X	X		X	X	
post-it notes ("yellow stickies")	X	X		X	X	
financial records	X	X		X	X	X
note pad	X	X		X	X	
other						
other						
other						

POST:

Item	Work	Personal	Same	Separate	Paper-based	Automated
desktop calendar						
date/timer (scheduler)	X	X	X		X	
"to do" list	X	X		X	X	
post-it notes ("yellow stickies")	X	X		X	X	
financial records	X	X		X		X
note pad	X	X	X		X	
other						
other						
other						

6. How do you remind yourself of what you need to do during the day?

Pre		Post
	I don't keep reminders	
X	"to do" list on a paper-based planner	X
	"to do" list on a desktop computer	
	"to do" list on an electronic organizer (Rex, Casio organizer, etc.)	
	"to do" list on a dry erase board or chalk board	
X	post-it notes ("yellow stickies")	X
	string around finger or rubber band around wrist	
	pocket voice recorder or message recording pen	
	other (please specify):	
	other (please specify):	
	other (please specify):	

7. What are the three most often used things on your desk?

Pre	Post
PEN	COMPUTER
COMPUTER	PEN
PHONE	PHONE

8. How do you organize your work files? (choose the most applicable):

Pre	Post
X	by project
	by topic
	by type
	by date
	other

9. How often do you organize your work-related files? (choose the most applicable):

Pre	Post
	Once per day
	a couple of times per week
X	once per week
	a couple of times a month
	once a month
	hardly ever
	never
	other

10. How do you organize your **personal** files? (choose the most applicable):

Pre		Post
	by project	
X	by topic	X
	by type	
	by date	
	other	

11. **How often** do you organize your **personal** files? (choose the most applicable):

Pre		Post
	once per day	
	a couple of times per week	
	once per week	
X	a couple of times a month	X
	once a month	
	hardly ever	
	never	
	other	

12. How do you communicate with people in job-related activities? (indicate **all that apply** in the "USE" column and then rank them in the "RANK" column with **1 being most important**):

Pre			Post	
USE	RANK	MEANS OF COMMUNICATION	USE	RANK
		video conferencing		
X	1	email	X	1
		pager/voicemail		
		telephone (cellular)		
X	2	telephone (regular)	X	2
		radio (walkie-talkie)		
X	3	written notes	X	3
		other (please specify):		

13. Which of the following electronic devices do you **currently** use **routinely** in your job? (indicate all that apply):

Pre		Post
	laptop computer	X
X	desktop computer	X
	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	
	cellular phone	
	pager	
X	fax machine	X
	camera (digital)	X
	camera (film)	X
	radio walkie-talkie	
	other (please specify):	

14. Which of the following electronic devices **have you used** in your job? (present or past - indicate all that apply):

Pre		Post
X	laptop computer	X
X	desktop computer	X
	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	
	cellular phone	X
	pager	
X	fax machine	X
X	camera (digital)	X
X	camera (film)	X
	radio walkie-talkie	X
	other (please specify):	

15. Which of the following electronic devices do you **currently** own? (indicate all that apply):

Pre		Post
X	laptop computer	X
	desktop computer	
	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	
X	cellular phone	X
	pager	
X	fax machine	X
	camera (digital)	
X	camera (film)	X
	radio walkie-talkie	
	other (please specify):	

16. Which of the following electronic devices have you owned previously but do not own any longer? (indicate all that apply):

Pre		Post
	laptop computer	
X	desktop computer	X
	personal digital assistant (PDA) such as PalmPilot, Newton or Cassiopeia	
	cellular phone	
	pager	
	fax machine	
	camera (digital)	
	camera (film)	
	radio walkie-talkie	
	other (please specify):	

17. Why do you no longer use the devices you indicated above? (Please explain each individually - indicate all that apply):

Pre	Post
LAPTOP IS MORE VERSATILE AND IS POWERFUL ENOUGH TO RUN DESKTOP FUNCTION. DESKTOP COMPUTER WAS REDUNDANT.	CANNOT AFFORD A NEW DESKTOP COMPUTER AT THIS TIME.

18. As you **conduct** a meeting or present a brief in your job, what materials do you prefer to use for your notes? (Indicate all applicable in the "USE" column and then rank these in order of preference in the "RANK" column - with 1 being your first choice):

Pre			Post		
USE	RANK	MEDIA FOR KEEPING MEETING NOTES	USE	RANK	
X	2	note pad, notebook, loose sheets of paper	X	3	
		scraps of paper (napkin, envelope, etc.)			
		index cards			
X	1	date-timer or organizer (paper-based)	X	1	
		computerized presentation software (PowerPoint, Corel Presentations, Freelance Graphics, etc.)	X	2	
		electronic organizer (PDA, pocket organizer, etc.)			
		other (please specify):			
		other (please specify):			
		other (please specify):			

19. If an ideal device was available that could assist you in your job, what would it do? Please be specific. (Use as much space as you need including the back of this page if necessary):

Pre	Post
<p>How big or small is it?: PALM SIZE</p> <p>How do you enter data?: VOICE, LIGHT PEN, KEYBOARD</p> <p>Functions: CALENDAR SPREADSHEET DATABASE WORD PROCESSING E-MAIL ADDRESS BOOK SCHEDULING.</p> <p>How does it work with other devices?: IR PORT AND BUILT IN CELLULAR MODEM.</p>	<p>How big or small is it?: SAME AS BEFORE</p> <p>How do you enter data?:</p> <p>Functions: SAME PLUS - NOTETAKING CAPABILITY</p> <p>How does it work with other devices?:</p>

- IN*
20. Imagine that everybody [^] your organization has the device you just described. How would that change your approach to meetings and routine job tasks?

Pre

Post

<p>- PERSONAL CONTACT AND INTERACTION IS STILL VITAL IN AN EFFECTIVE ORGANIZATION BUT USE WOULD IMPROVE ROUTINE CORRESPONDENCE, SCHEDULING OF MEETINGS AND THE TRANSFER OF INFORMATION</p>	<p>STILL AGREE WITH MY PRE PRE-</p>
---	--

21. Imagine the following scenarios:

- a. You are passing a work associate in the passageway. She asks if you knew about a meeting scheduled for later in the week. You were not aware of the meeting. What do you do next? How do you plan to recall the meeting time and location? (Please use back of page if necessary):

Pre

Post

<p>WRITE A NOTE IN THE THE WHEEL BOOK IN MY POCKET THEN TRANSFER IT TO MY CALENDAR UPON RETURNING TO MY OFFICE.</p>	<p>SAME AS PRE</p>
--	--------------------

- b. While having lunch, you see someone you had known at a previous duty station. You ask for his phone number or address in order to stay in touch. What do you do next? How do you plan to record the phone number or address? (Please use back of page if necessary):

Pre

Post

WRITE IT DOWN IN MY WHEEL BOOK AND TRANSFER TO MY ADDRESS BOOK UPON RETURNING TO OFFICE.	ON IN A NAPKIN. I NO LONGER CARRY THE WHEELBOOK EVERYWHERE.
--	--

- c. While in a Department Head meeting your Commanding Officer asks you for information that you do not have with you. You know this information is on your desktop computer and is easily available from any networked computer. There are network connections throughout the meeting room. What do you do next? How do you plan to retrieve the desired information? Would you be comfortable with getting up from the table to access one of the network connections? Why?

Pre

Post

-DEPENDS ON THE INFORMATION REQUESTED. IF NEEDED IMMEDIATELY, I WOULD REQUEST CHANCE TO USE ONE OF NETWORK CONNECTIONS TO PULL INFORMATION FROM MY OFFICE COMPUTER. IF NOT ABSOLUTELY VITAL THIS MOMENT WOULD GIVE BRIEF OUTLINE OF WHAT I KNOW AND FORWARD MORE DETAILED INFO LATER.	SAME AS PRE
---	-------------

- d. You have just been called to a meeting that is to start in a half hour. No other information regarding the meeting is available. What do you do next? What information and in what form do you prepare to take with you? (Please use back of page if necessary):

Pre

Post

I NORMALLY KEEP A 3-RING BINDER WITH BRIEF SHEETS AND SUMMARY DATA ON THE MOST PRESSING TOPICS, OR POTENTIAL TOPICS. I WOULD BRING THIS TO THE MEETING IF TOPIC OF MEETING TOUCHED ON SOMETHING NOT IN NOTEBOOK, I WOULD BRIEF TO BEST OF KNOWLEDGE AND PROVIDE MORE DETAILED INFO AT LATER TIME.	SAME AS PRE
---	-------------

22. Please indicate all the following software applications you have used:

Pre		Post
<input checked="" type="checkbox"/>	Word Processor (Word Perfect, Ms Word, Word Pro, Clarisworks, Pagemaker Etc.)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Spreadsheet (Excel, Lotus 1-2-3, Quattro Pro, ClarisWorks, etc.)	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Database (FoxPro, Access, Paradox, FileMaker, ClarisWorks, etc.)	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Calendar/Day-Timer (Lotus Organizer, MS Outlook, ACT!, Sidekick, etc.)	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Web Browser (Netscape, Internet Explorer, America Online, etc.)	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Presentation (PowerPoint, Corel Presentations, Freelance Graphics, Acrobat, etc.)	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Email (cc:Mail, America Online, MS Outlook, Netscape, Internet Explorer, etc.)	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Contact Management (Lotus Organizer, ACT!, Sidekick, etc.)	<input checked="" type="checkbox"/>

23. Regarding my knowledge in computers, I consider myself to be:

Pre	KNOWLEDGEABLE	Post
<input type="checkbox"/>	Very <u>U</u> nknowledgeable	<input type="checkbox"/>
<input type="checkbox"/>	Somewhat <u>U</u> nknowledgeable	<input type="checkbox"/>
<input type="checkbox"/>	Somewhat Knowledgeable	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Knowledgeable	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Very Knowledgeable	<input type="checkbox"/>

24. Regarding my proficiency with computers, I consider myself to be:

Pre	PROFICIENCY	Post
<input type="checkbox"/>	Very <u>N</u> on-proficient	<input type="checkbox"/>
<input type="checkbox"/>	Somewhat <u>N</u> on-proficient	<input type="checkbox"/>
<input type="checkbox"/>	Somewhat Proficient	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Proficient	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Very Proficient	<input type="checkbox"/>

25. Regarding my comfort with using computers, I consider myself to be:

Pre	COMFORT	Post
<input type="checkbox"/>	Very <u>U</u> ncomfortable	<input type="checkbox"/>
<input type="checkbox"/>	Somewhat <u>U</u> ncomfortable	<input type="checkbox"/>
<input type="checkbox"/>	Somewhat Comfortable	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Comfortable	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Very Comfortable	<input type="checkbox"/>

Thank you for your time in completing this survey and for your participation in this project. The information you have provided will be very beneficial in this study of work activities. If you wish, results of this study will be made available to you by checking the block below.

☒ Please send me a copy of the results of this study.

PART II: NPS-SOPCP PALMTOP TECHNOLOGY SURVEY

SUBJECT #1

NPS-SOPCP Palmtop Technology Survey

The following questions should only be answered after having used the PDA regularly at the end of the second and forth week of the study.

1. Are you satisfied with the interface between your PC and your PDA?

Week 2		Week 4
<input checked="" type="checkbox"/>	YES, I am satisfied	
	NO, I am not satisfied	
	I do not need to interface my PDA with my PC	<input checked="" type="checkbox"/>

2. The **size** of the PDA (please indicate one):

Week 2		Week 4
	encouraged me to carry it with me and use it	
<input checked="" type="checkbox"/>	had no influence in my use of it	
	discouraged me from carrying it with me and using it	<input checked="" type="checkbox"/>

3. The **manner in which data is entered** into the PDA (please indicate one):

Week 2		Week 4
	encouraged me to carry it with me and use it	
	had no influence in my use of it	
<input checked="" type="checkbox"/>	discouraged me from carrying it with me and using it	<input checked="" type="checkbox"/>

4. Overall, the PDA is (please indicate one):

Week 2		Week 4
	convenient to use	
<input checked="" type="checkbox"/>	inconvenient to use	<input checked="" type="checkbox"/>

5. I believe all Naval officers could benefit from using a PDA in their jobs.

Week 2		Week 4
	TRUE	
<input checked="" type="checkbox"/>	FALSE	<input checked="" type="checkbox"/>

6. I am considering procuring (either buying it yourself or allocating OPTAR funds) a PDA for use in my job.

Week 2		Week 4
	TRUE	
<input checked="" type="checkbox"/>	FALSE	<input checked="" type="checkbox"/>

7. I am considering buying a PDA for my personal use.

Week 2		Week 4
<input checked="" type="checkbox"/>	TRUE	
	FALSE	<input checked="" type="checkbox"/>

8. I prefer the PDA to my previous methods of information storage and retrieval.

Week 2		Week 4
	TRUE	
X	FALSE	X

9. I believe the PDA has increased my productivity.

Week 2		Week 4
	TRUE	
X	FALSE	X

Please explain why:

Please see attached continuation sheet

10. Please indicate all of the following functions you have utilized regularly on the PDA.

Week 2		Week 4
X	Word Processor (Microsoft Pocket Word)	
	Spreadsheet (Microsoft Pocket Excel)	
	Database (Please specify what program you used: _____)	
X	Calendar/Day-Timer (Calendar - Microsoft Pocket Outlook)	X
	Web Browser (Microsoft Pocket Internet Explorer)	
	Presentations (Microsoft Pocket PowerPoint)	
X	Email (In-Box - Microsoft Pocket Outlook)	
X	Contact Management/Address Book (Contacts - Microsoft Pocket Outlook)	X
	Handwriting Recognition (Calligrapher)	
	Other (Please specify: _____)	

11. Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA simplifies my routine job tasks	
X	The PDA complicates my routine job tasks	X
	I have no strong opinion	

Please explain why:

Please see attached continuation sheet.

12. Which of the following statements is more appropriate?

Week 2		Week 4	
<input type="checkbox"/>	The PDA saves me a lot of time and effort in my job-related tasks	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	The PDA increased the amount of time and effort necessary to accomplish my job-related tasks	<input checked="" type="checkbox"/>	

Please explain why:

Please see attached continuation sheet.

13. I found myself creating tasks to use my PDA for although I previously did not think I needed them while mobile.

Week 2		Week 4	
<input type="checkbox"/>	TRUE	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	FALSE	<input checked="" type="checkbox"/>	

14. Please list and explain any additional tasks you would have liked to have been able to automate on your PDA:

None.

15. Please list and explain any complaints you have regarding your PDA:

Please see attached continuation sheet

16. Please use the remaining space and the back of this page for any additional comments:

Fascinated with the technology!! Love the idea of it - can see real potential. BUT, just didn't end up being the kind of tool I need in this job.

Continuation sheet.

Questions 9, 11, and 12:

This is not true in every case. The calendar, contacts ("address book") and tasks functions are very helpful. At this time however, since my desktop PC contains non-compatible software, I had to enter scheduling and tasking items twice. I have a very busy schedule and often have back-to-back meetings which sometimes run over the time limit. It was helpful to have the audio reminder. The contact list and task list function were also handy to have with me at all times (usually I keep it on my desktop PC and refer to while in my office); so I could update it as tasking came up (usually, write it down and then enter it into my PC later).

I can see how the PDA would have benefitted me in earlier jobs when I was managing projects, going to off site planning meetings, writing briefing slides, etc. With the recent flooding from storms I could see how it would be useful to take to the site to record storm damage. However, in my current position as XO, a PDA ("mini-laptop") is not really the tool I need. Reasons:

- As XO, the main method of communication is face-to-face. People often come with very personal problems and taking notes on a computer, which comes across as very impersonal and "cold" did not seem appropriate. At meetings, someone else takes notes and writes minutes. I take a notebook and for the few phrases I write down, it was easier to just write them then call up the application I needed and type it in.
- Since my use of even a desktop computer has declined significantly, my computer skills have also declined, so I found that I had to spend time trying to learn/figure things out * time I don't have. As time went by, it got easier, but I didn't find it to be a quick easy tool to use.
- E-mail is the main application I use in my job. I receive/send a large volume of e-mail daily. I typically receive only during regular business hours and rarely have to access it at home. However, I can see how in previous jobs, this would have been a benefit - although, a laptop could serve the same purpose.
- Found what I really could use is an electronic organizer.

Question 15:

- Size: It was not easy to carry it around. Can't put in a uniform pocket. I often carry folders etc. and would have to balance it - was worried I'd drop it! So, it was inconvenient (like an extra burden) to carry around.
- Keyboard not bad for a small machine and the screen was quite readable. Did not like the handwriting recognition program - it didn't like my handwriting and I ended up having to correct all the time. So, I gave that function up after the second day.

added note - I ended up not using it the last 10¹⁴ days of the study - I was too busy!

SUBJECT #2

NPS-SOPCP Palmtop Technology Survey

The following questions should only be answered after having used the PDA regularly at the end of the second and forth week of the study.

1. Are you satisfied with the interface between your PC and your PDA?

Week 2		Week 4
<input checked="" type="checkbox"/>	YES, I am satisfied	<input checked="" type="checkbox"/>
<input type="checkbox"/>	NO, I am not satisfied	<input type="checkbox"/>
<input type="checkbox"/>	I do not need to interface my PDA with my PC	<input type="checkbox"/>

2. The size of the PDA (please indicate one):

Week 2		Week 4
<input type="checkbox"/>	encouraged me to carry it with me and use it	<input type="checkbox"/>
<input type="checkbox"/>	had no influence in my use of it	<input type="checkbox"/>
<input checked="" type="checkbox"/>	discouraged me from carrying it with me and using it	<input checked="" type="checkbox"/>

3. The manner in which data is entered into the PDA (please indicate one):

Week 2		Week 4
<input type="checkbox"/>	encouraged me to carry it with me and use it	<input type="checkbox"/>
<input type="checkbox"/>	had no influence in my use of it	<input type="checkbox"/>
<input checked="" type="checkbox"/>	discouraged me from carrying it with me and using it	<input checked="" type="checkbox"/>

4. Overall, the PDA is (please indicate one):

Week 2		Week 4
<input type="checkbox"/>	convenient to use	<input type="checkbox"/>
<input checked="" type="checkbox"/>	inconvenient to use	<input checked="" type="checkbox"/>

5. I believe all Naval officers could benefit from using a PDA in their jobs.

Week 2		Week 4
<input checked="" type="checkbox"/>	TRUE	<input checked="" type="checkbox"/>
<input type="checkbox"/>	FALSE	<input type="checkbox"/>

6. I am considering procuring (either buying it yourself or allocating OPTAR funds) a PDA for use in my job.

Week 2		Week 4
<input type="checkbox"/>	TRUE	<input type="checkbox"/>
<input checked="" type="checkbox"/>	FALSE	<input checked="" type="checkbox"/>

7. I am considering buying a PDA for my personal use.

Week 2		Week 4
<input type="checkbox"/>	TRUE	<input type="checkbox"/>
<input checked="" type="checkbox"/>	FALSE	<input checked="" type="checkbox"/>

8. I prefer the PDA to my previous methods of information storage and retrieval.

Week 2		Week 4
	TRUE	
✓	FALSE	✓

9. I believe the PDA has increased my productivity.

Week 2		Week 4
	TRUE	
✓	FALSE	✓

Please explain why:

10. Please indicate all of the following functions you have utilized regularly on the PDA.

Week 2		Week 4
	Word Processor (Microsoft Pocket Word)	
	Spreadsheet (Microsoft Pocket Excel)	
	Database (Please specify what program you used: _____)	
✓	Calendar/Day-Timer (Calendar - Microsoft Pocket Outlook)	
	Web Browser (Microsoft Pocket Internet Explorer)	
	Presentations (Microsoft Pocket PowerPoint)	
	Email (In-Box - Microsoft Pocket Outlook)	
✓	Contact Management/Address Book (Contacts - Microsoft Pocket Outlook)	
✓	Handwriting Recognition (Calligrapher)	
	Other (Please specify: <u>REALLY DIDN'T USE IT ALL THAT MUCH.</u>)	✓

11. Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA simplifies my routine job tasks	
	The PDA complicates my routine job tasks	
✓	I have no strong opinion	✓

Please explain why:

12. Which of the following statements is more appropriate?

Week 2		Week 4	
	The PDA saves me a lot of time and effort in my job-related tasks		
✓	The PDA increased the amount of time and effort necessary to accomplish my job-related tasks		✓

Please explain why:

13. I found myself creating tasks to use my PDA for although I previously did not think I needed them while mobile.

Week 2		Week 4	
	TRUE		
✓	FALSE		✓

DID NOT CARRY IT WITH ME VERY MUCH.

14. Please list and explain any additional tasks you would have liked to have been able to automate on your PDA:

- GPS RECEIVER
- TV RECEPTION
- AM/FM RECEIVER
- PRINTER
- SCANNER
- DIGITAL CAMERA
- VOICE MEMO RECORDER
- FLASHLIGHT
- SPACE FOR KEYS/IDENTIFICATION/

15. Please list and explain any complaints you have regarding your PDA:

- STILL TOO BULKY
- NEEDS VOICE INPUT/OUTPUT
- OUTPUT FROM NAME/ADDRESS/TELEPHONE DATABASE IS NOT USEFUL
- NEEDS DATABASE REPORTING FLEXIBILITY.
- NEEDS A GOOD MONTHLY CALENDAR PRINTOUT.
- CASH/CHECKBOOK
- NEEDS BAYONET LOCKING LUG (JUST KIDDING!)

16. Please use the remaining space and the back of this page for any additional comments:

SUBJECT #3

NPS-SOPCP Palmtop Technology Survey

The following questions should only be answered after having used the PDA regularly at the end of the second and forth week of the study.

1. Are you satisfied with the interface between your PC and your PDA?

Week 2		Week 4
<input type="checkbox"/>	YES, I am satisfied	<input type="checkbox"/>
<input type="checkbox"/>	NO, I am not satisfied	<input type="checkbox"/>
<input checked="" type="checkbox"/>	I do not need to interface my PDA with my PC	<input checked="" type="checkbox"/>

2. The size of the PDA (please indicate one):

Week 2		Week 4
<input type="checkbox"/>	encouraged me to carry it with me and use it	<input type="checkbox"/>
<input type="checkbox"/>	had no influence in my use of it	<input type="checkbox"/>
<input checked="" type="checkbox"/>	discouraged me from carrying it with me and using it	<input checked="" type="checkbox"/>

3. The manner in which data is entered into the PDA (please indicate one):

Week 2		Week 4
<input type="checkbox"/>	encouraged me to carry it with me and use it	<input type="checkbox"/>
<input type="checkbox"/>	had no influence in my use of it	<input type="checkbox"/>
<input checked="" type="checkbox"/>	discouraged me from carrying it with me and using it	<input checked="" type="checkbox"/>

4. Overall, the PDA is (please indicate one):

Week 2		Week 4
<input type="checkbox"/>	convenient to use	<input type="checkbox"/>
<input checked="" type="checkbox"/>	inconvenient to use	<input checked="" type="checkbox"/>

5. I believe all Naval officers could benefit from using a PDA in their jobs.

Week 2		Week 4
<input checked="" type="checkbox"/>	TRUE	<input type="checkbox"/>
<input type="checkbox"/>	FALSE	<input checked="" type="checkbox"/>

6. I am considering procuring (either buying it yourself or allocating OPTAR funds) a PDA for use in my job.

Week 2		Week 4
<input type="checkbox"/>	TRUE	<input type="checkbox"/>
<input checked="" type="checkbox"/>	FALSE	<input checked="" type="checkbox"/>

7. I am considering buying a PDA for my personal use.

Week 2		Week 4
<input type="checkbox"/>	TRUE	<input type="checkbox"/>
<input checked="" type="checkbox"/>	FALSE	<input checked="" type="checkbox"/>

8. I prefer the PDA to my previous methods of information storage and retrieval.

Week 2		Week 4
	TRUE	
X	FALSE	X

9. I believe the PDA has increased my productivity.

Week 2		Week 4
	TRUE	
X	FALSE	X

Please explain why:

10. Please indicate all of the following functions you have utilized regularly on the PDA.

Week 2		Week 4
	Word Processor (Microsoft Pocket Word)	
	Spreadsheet (Microsoft Pocket Excel)	
	Database (Please specify what program you used: _____)	
X	Calendar/Day-Timer (Calendar - Microsoft Pocket Outlook)	X
	Web Browser (Microsoft Pocket Internet Explorer)	
	Presentations (Microsoft Pocket PowerPoint)	
	Email (In-Box - Microsoft Pocket Outlook)	
X	Contact Management/Address Book (Contacts - Microsoft Pocket Outlook)	X
	Handwriting Recognition (Calligrapher)	
	Other (Please specify: _____)	

11. Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA simplifies my routine job tasks	
X	The PDA complicates my routine job tasks	X
	I have no strong opinion	

Please explain why:

12. Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA saves me a lot of time and effort in my job-related tasks	
X	The PDA increased the amount of time and effort necessary to accomplish my job-related tasks	X

Please explain why:

13. I found myself creating tasks to use my PDA for although I previously did not think I needed them while mobile.

Week 2		Week 4
	TRUE	
X	FALSE	X

14. Please list and explain any additional tasks you would have liked to have been able to automate on your PDA:

Too many functions w/ limited capabilities.

15. Please list and explain any complaints you have regarding your PDA:

I need a reminder unit, not a desktop trapped in a micro organism!

16. Please use the remaining space and the back of this page for any additional comments:

SUBJECT #4

NPS-SOPCP Palmtop Technology Survey

The following questions should only be answered after having used the PDA regularly at the end of the second and forth week of the study.

1. Are you satisfied with the interface between your PC and your PDA?

Week 2		Week 4
<input checked="" type="checkbox"/>	YES, I am satisfied	<input checked="" type="checkbox"/>
<input type="checkbox"/>	NO, I am not satisfied	<input type="checkbox"/>
<input type="checkbox"/>	I do not need to interface my PDA with my PC	<input type="checkbox"/>

2. The size of the PDA (please indicate one):

Week 2		Week 4
<input type="checkbox"/>	encouraged me to carry it with me and use it	<input type="checkbox"/>
<input checked="" type="checkbox"/>	had no influence in my use of it	<input checked="" type="checkbox"/>
<input type="checkbox"/>	discouraged me from carrying it with me and using it	<input type="checkbox"/>

3. The manner in which data is entered into the PDA (please indicate one):

Week 2		Week 4
<input type="checkbox"/>	encouraged me to carry it with me and use it	<input type="checkbox"/>
<input checked="" type="checkbox"/>	had no influence in my use of it	<input checked="" type="checkbox"/>
<input type="checkbox"/>	discouraged me from carrying it with me and using it	<input type="checkbox"/>

4. Overall, the PDA is (please indicate one):

Week 2		Week 4
<input type="checkbox"/>	convenient to use	<input type="checkbox"/>
<input checked="" type="checkbox"/>	inconvenient to use	<input checked="" type="checkbox"/>

5. I believe all Naval officers could benefit from using a PDA in their jobs.

Week 2		Week 4
<input checked="" type="checkbox"/>	TRUE	<input checked="" type="checkbox"/>
<input type="checkbox"/>	FALSE	<input type="checkbox"/>

6. I am considering procuring (either buying it yourself or allocating OPTAR funds) a PDA for use in my job.

Week 2		Week 4
<input checked="" type="checkbox"/>	TRUE	<input type="checkbox"/>
<input checked="" type="checkbox"/>	FALSE	<input checked="" type="checkbox"/>

7. I am considering buying a PDA for my personal use.

Week 2		Week 4
<input checked="" type="checkbox"/>	TRUE	<input checked="" type="checkbox"/>
<input type="checkbox"/>	FALSE	<input type="checkbox"/>

8. I prefer the PDA to my previous methods of information storage and retrieval.

Week 2		Week 4
<input checked="" type="checkbox"/>	TRUE	<input checked="" type="checkbox"/>
<input type="checkbox"/>	FALSE	<input type="checkbox"/>

9. I believe the PDA has increased my productivity.

Week 2		Week 4
<input checked="" type="checkbox"/>	TRUE	<input checked="" type="checkbox"/>
<input type="checkbox"/>	FALSE	<input type="checkbox"/>

Please explain why:

10. Please indicate all of the following functions you have utilized regularly on the PDA.

Week 2		Week 4
<input checked="" type="checkbox"/>	Word Processor (Microsoft Pocket Word)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Spreadsheet (Microsoft Pocket Excel)	<input type="checkbox"/>
<input type="checkbox"/>	Database (Please specify what program you used: _____)	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Calendar/Day-Timer (Calendar - Microsoft Pocket Outlook)	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Web Browser (Microsoft Pocket Internet Explorer)	<input type="checkbox"/>
<input type="checkbox"/>	Presentations (Microsoft Pocket PowerPoint)	<input type="checkbox"/>
<input type="checkbox"/>	Email (In-Box - Microsoft Pocket Outlook)	<input type="checkbox"/>
<input type="checkbox"/>	Contact Management/Address Book (Contacts - Microsoft Pocket Outlook)	<input type="checkbox"/>
<input type="checkbox"/>	Handwriting Recognition (Calligrapher)	<input type="checkbox"/>
<input type="checkbox"/>	Other (Please specify: _____)	<input type="checkbox"/>

11. Which of the following statements is more appropriate?

Week 2		Week 4
<input checked="" type="checkbox"/>	The PDA simplifies my routine job tasks	<input checked="" type="checkbox"/>
<input type="checkbox"/>	The PDA complicates my routine job tasks	<input type="checkbox"/>
<input type="checkbox"/>	I have no strong opinion	<input type="checkbox"/>

Please explain why:

The PDA does work out great for meetings,
but its layout is cumbersome.

12. Which of the following statements is more appropriate?

Week 2		Week 4	
<input checked="" type="checkbox"/>	The PDA saves me a lot of time and effort in my job-related tasks	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	The PDA increased the amount of time and effort necessary to accomplish my job-related tasks		<input type="checkbox"/>

Please explain why:

It saves me the hassle of retying notes for distribution.

13. I found myself creating tasks to use my PDA for although I previously did not think I needed them while mobile.

Week 2		Week 4	
<input type="checkbox"/>	TRUE	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	FALSE	<input checked="" type="checkbox"/>	

14. Please list and explain any additional tasks you would have liked to have been able to automate on your PDA:

This PDA has more than enough tasks, ~~not~~

15. Please list and explain any complaints you have regarding your PDA:

The PDA is great, but it has more of "baby Laptop" feel to it. The size is fine, but the program layout and ^{data} entry method can make most computer users uncomfortable. For someone to be comfortable with this vice pen & paper, it needs more of a familiar pen & paper feel (ie. use's Palm Top).

16. Please use the remaining space and the back of this page for any additional comments:

I have tried to use this PDA for almost every option available on it. I am not too fond of the e-mail, and the fax doesn't really substantiate its existence. To be honest, the scheduler & word processor (for note taking) are the only things that I found really useful!

SUBJECT #5

NPS-SOPCP Palmtop Technology Survey

The following questions should only be answered after having used the PDA regularly at the end of the second and forth week of the study.

1. Are you satisfied with the interface between your PC and your PDA?

Week 2		Week 4
<input type="checkbox"/>	YES, I am satisfied	<input type="checkbox"/>
<input type="checkbox"/>	NO, I am not satisfied	<input type="checkbox"/>
<input checked="" type="checkbox"/>	I do not need to interface my PDA with my PC	<input checked="" type="checkbox"/>

*DID NOT
REGULARLY
USE*

2. The size of the PDA (please indicate one):

Week 2		Week 4
<input type="checkbox"/>	encouraged me to carry it with me and use it	<input type="checkbox"/>
<input type="checkbox"/>	had no influence in my use of it	<input type="checkbox"/>
<input checked="" type="checkbox"/>	discouraged me from carrying it with me and using it	<input checked="" type="checkbox"/>

3. The manner in which data is entered into the PDA (please indicate one):

Week 2		Week 4
<input type="checkbox"/>	encouraged me to carry it with me and use it	<input type="checkbox"/>
<input type="checkbox"/>	had no influence in my use of it	<input type="checkbox"/>
<input checked="" type="checkbox"/>	discouraged me from carrying it with me and using it	<input checked="" type="checkbox"/>

4. Overall, the PDA is (please indicate one):

Week 2		Week 4
<input type="checkbox"/>	convenient to use	<input type="checkbox"/>
<input checked="" type="checkbox"/>	inconvenient to use	<input checked="" type="checkbox"/>

5. I believe all Naval officers could benefit from using a PDA in their jobs.

Week 2		Week 4
<input checked="" type="checkbox"/>	TRUE	<input checked="" type="checkbox"/>
<input type="checkbox"/>	FALSE	<input type="checkbox"/>

6. I am considering procuring (either buying it yourself or allocating OPTAR funds) a PDA for use in my job.

Week 2		Week 4
<input type="checkbox"/>	TRUE	<input type="checkbox"/>
<input checked="" type="checkbox"/>	FALSE	<input checked="" type="checkbox"/>

7. I am considering buying a PDA for my personal use.

Week 2		Week 4
<input type="checkbox"/>	TRUE	<input type="checkbox"/>
<input checked="" type="checkbox"/>	FALSE	<input checked="" type="checkbox"/>

8. I prefer the PDA to my previous methods of information storage and retrieval.

Week 2		Week 4
	TRUE	
X	FALSE	X

9. I believe the PDA has increased my productivity.

Week 2		Week 4
	TRUE	
X	FALSE	X

Please explain why:

10. Please indicate all of the following functions you have utilized regularly on the PDA.

Week 2		Week 4
	Word Processor (Microsoft Pocket Word)	
	Spreadsheet (Microsoft Pocket Excel)	
	Database (Please specify what program you used: _____)	
X	Calendar/Day-Timer (Calendar - Microsoft Pocket Outlook)	X
	Web Browser (Microsoft Pocket Internet Explorer)	X
	Presentations (Microsoft Pocket PowerPoint)	
X	Email (In-Box - Microsoft Pocket Outlook)	X
	Contact Management/Address Book (Contacts - Microsoft Pocket Outlook)	
X	Handwriting Recognition (Calligrapher)	X
	Other (Please specify: _____)	

11. Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA simplifies my routine job tasks	
X	The PDA complicates my routine job tasks	X
	I have no strong opinion	

Please explain why: IT STILL HAS SOME LIMITATIONS. IT IS SLOW ON HAND WRITING RECOGNITION AND IS NOT SET-UP TO YARE FOR A NOTETAKING FUNCTION. MACHINE NEEDS TO BE IMPROVED TO BE USEFUL

12. Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA saves me a lot of time and effort in my job-related tasks	
X	The PDA increased the amount of time and effort necessary to accomplish my job-related tasks	X

Please explain why: FOUND MYSELF HAVING TO RE-WRITE OR TYPE MANY ~~2~~ WORDS/PHRASES BECAUSE THE HANDWRITING RECOGNITION SOFTWARE IS SLOW AND QUERKY.

13. I found myself creating tasks to use my PDA for although I previously did not think I needed them while mobile.

Week 2		Week 4
	TRUE	
X	FALSE	X

14. Please list and explain any additional tasks you would have liked to have been able to automate on your PDA:

1. NOTETAKING FUNCTION THAT BULLETIZES AND PAGINATES. - VOICE RECOGNITION WOULD BE A GOOD ADDITION

15. Please list and explain any complaints you have regarding your PDA:

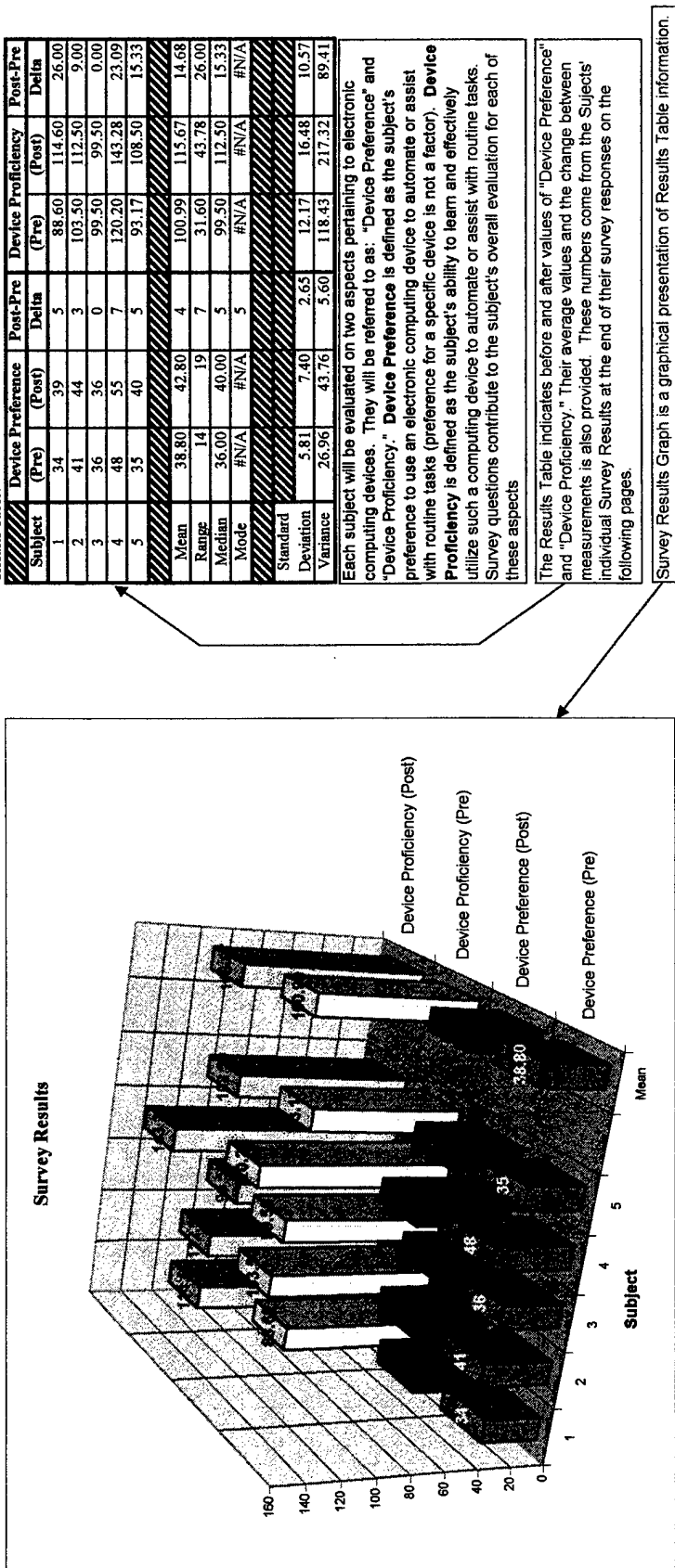
- IT WAS CUMBERSOM TO CARRY IN UNIFORM.

16. Please use the remaining space and the back of this page for any additional comments:

**APPENDIX C: ANALYSES OF NAVAL POSTGRADUATE SCHOOL STAFF
OFFICER PALMTOP COMPUTER PROJECT SURVEYS**

PART I: NPS-SOPCP SURVEY ANALYSIS

NPS-SOPCP Survey Summary



Except for Subject #4, all subjects are similar in the traits measured by the survey. If his scores are not included, the resulting averages are: These averages are much closer to the actual scores of the remaining participants. Subject #4 was the most computer knowledgeable of the study group and made the most use of the palmtop. He was also the individual making the most favorable comments.

Device Preference		Device Proficiency	
(Pre)	(Post)	(Pre)	(Post)
36.50	39.75	96.19	108.77

Project Participants:

Subject	Rank	Service	Title	Sex
0	CDR (O-5)	USN	Executive Officer	F
2	LtCol (O-5)	USMC	Marine Representative	M
3	LCDR (O-4)	USN	Asst. Programs Officer	F
4	LT (O-3)	USN	Material Division, Supply Officer	M
5	LT (O-3)	USN	Asst. Public Works Officer	M

Project Participants Table anonymously lists and briefly describes all Naval officers participating in the study.

Device Proficiency Rating Scale:

Value	Description	Example Devices	Example Applications
1	Basic on-off operation, no other user interaction, no special skill or knowledge required	Household appliances, camera, toaster, blender, pocket tape recorder, Post-It notes, note pad, etc.	Note-taking, sketching, writing a list, etc. (This category does not contain software applications)
2	Simple interaction or interface very limited skill or knowledge required	Household appliances, phone, television, calendar, pager, fax machine, etc.	Word processor, email, calendar, address book, voicemail, etc.
3	Limited user input, interface requires user to be somewhat familiar and knowledgeable	VCR, cellular phone, digital camera, date-timer, electronic organizer, etc.	Web browser, personal information manager (PIM), etc.
4	Extensive user interaction with complex interface, significant user knowledge required	Desktop computer, scientific calculator, etc.	Presentation software, spreadsheet, most financial management applications, etc.
5	Same as 4 but involves portability and mobility and possibly remote/wireless capabilities	Portable computer, laptop, palmtop, PDA, etc.	Database, network management, video teleconferencing, etc.

Throughout this survey, Proficiency Values are assigned on a scale from 1 to 5. These are weights based on technological complexity and portability/mobility.

Corellation Analysis

Totals represent the summation of responses by all participants for the indicated item.

Question #

1

First piece of information looked at:

	Pre	Post
daily schedule	2	3
"to do" list	0	0
voicemail and phone messages	0	0
plan of the day	0	0
email	3	2
headline news from newspapers	0	0
headline news from web sites	0	0
headline news from another source	0	0
other, please specify:	0	0

Notes in Red, Green and Brown text are analytical comments derived from the analysis of the correspondingly colored data.

Notes in Blue text boxes describe spreadsheet calculations and functions.

Daily schedules and Email were the most commonly selected pieces of work-related information looked at first upon arriving at work.

Comments are color coded to match corresponding data.

2 Three most important job tasks:

(Below is a compilation of individual responses.)

Pre	Post
email	email
calendar (computer and paper)	calendar (computer and paper)
"to do" list (paper)	"to do" list (paper)
daily schedule	daily schedule
email	email
phone calls	phone calls
email	email
in-box	message traffic
action items	"to do" list
email	daily schedule
voicemail	email
"to do" list	prioritize tasks
prioritize tasks	email
organize information	organize information

Pre	Total	Topic
100.00%	5	email
80.00%	4	"to do" list, action items, tasks
40.00%	2	calendar, daily schedule
20.00%	1	phone
20.00%	1	in-box
20.00%	1	voicemail
20.00%	1	organize information
	15	Check-Sum

Post	Total	Topic
100.00%	5	email
60.00%	3	"to do" list, action items, tasks
60.00%	3	calendar, daily schedule
20.00%	1	phone
20.00%	1	voicemail
20.00%	1	message traffic
20.00%	1	organize information
	15	Check-Sum

Aggregate lists of the above items.

Email is the most important information to the participants.

The second most important is a "to do" or task list.

The third most important information item is a calendar or daily schedule.

Check-sums are used to validate data entry and spreadsheet calculations (5 participants X 3 items = 15)

Immediate access to WORK-related information

USE:

Percentage	Total	Topic	Pre	Post
100.00%	5	daily schedule		
100.00%	5	"to do" list		
80.00%	4	address book		
100.00%	5	project documents		
	0	news headlines		
60.00%	3	financial reports		
40.00%	2	voicemail		
100.00%	5	email		
60.00%	3	world wide web browsing		
	0	other (please specify):		

All participants use daily schedules, "to do" lists and email in WORK-related activities.

Only the first five rankings were used in this analysis. Some participants ranked more than five items and one only ranked three.

Topic	1st	2nd	3rd	4th	5th	Check-Sum
daily schedule	1	1	2	1		5
"to do" list	1	2	2			5
address book		3				3
project documents				4	2	6
news headlines						0
financial reports				1		1
voicemail			1			1
email	3	1		1		5
world wide web browsing		2				2
other (please specify):						0
Check-Sum:	5	5	5	5	5	25

Pre: 5participants*5rankings=25responses
Post: 4participants*5rankings+1participant*3rankings=23responses

Note: Check-Sum does not reconcile with the above Totals because Totals include more than 5 rankings for some participants.

Topic	1st	2nd	3rd	4th	5th	Check-Sum
daily schedule	20.00%	20.00%	40.00%	20.00%		100.00%
"to do" list	20.00%	40.00%	40.00%			100.00%
address book		60.00%				60.00%
project documents				80.00%	20.00%	100.00%
news headlines						0
financial reports				25.00%		25.00%
voicemail		20.00%	20.00%			40.00%
email	60.00%	20.00%	20.00%			100.00%
world wide web browsing				25.00%		25.00%
other (please specify):						0
Check-Sum:	100.00%	100.00%	100.00%	100.00%	100.00%	500.00%

Email was most often ranked first at the beginning of the study.

At the end of the study, daily schedule became the item most often ranked 1st. It also had the greatest increase in priority going from a 1st ranking of 20% to 60%.

4 Immediate access to personal information

USE:

Pre	Post
Percentage	Percentage
100.00%	100.00%
80.00%	80.00%
100.00%	100.00%
0	0
0	0
20.00%	20.00%
20.00%	20.00%
60.00%	60.00%
20.00%	20.00%
0	0

All participants use daily schedules and address books to manage PERSONAL information.
80% use "to do" lists in their PERSONAL lives.
60% use email in their PERSONAL lives.

Topic	1st	2nd	3rd	4th	5th	Check-Sum
daily schedule	1	3	1	1	1	5
"to do" list	2	1	2	1	1	4
address book				2		5
project documents						0
news headlines						0
financial reports						1
voicemail						1
email						1
world wide web browsing	2	1	1	1	1	3
other (please specify):						1
Check-Sum:	5	5	5	3	2	2

Pre: 2participants*5rankings+2participants*3rankings+1participants*4rankings=20responses
Post: 2participants*5rankings+2participants*3rankings+1participants*4rankings=20responses

Topic	1st	2nd	3rd	4th	5th	Check-Sum
daily schedule	20.00%	60.00%	20.00%	33.33%		
"to do" list	40.00%	20.00%	20.00%	20.00%		
address book				66.67%		
project documents						
news headlines						
financial reports						
voicemail		20.00%				
email	40.00%	20.00%	20.00%			
world wide web browsing						
other (please specify):						
Check-Sum:	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Email and "to do" lists were the two forms of PERSONAL information that most people needed immediate access to throughout the day.
At the end of the study, most people selected daily schedules as their most important PERSONAL information item.

3, 4 and 5 Comparison of work-related and personal information needs:

USE:

Pre		Post	
Work	Personal	Work	Personal
5	5	5	5
5	4	5	4
4	5	3	5
5	0	4	0
0	0	0	0
3	1	3	1
2	1	2	1
5	3	5	3
3	1	3	1
0	0	0	0

All participants USE daily schedules, "to-do" lists and email for WORK-related information.
For PERSONAL information, all participants USE daily schedules and address books, while 80% USE "to-do" lists
60% USE email for PERSONAL information.

Organizational Orientation:

Measures the degree to which the subject utilizes paper-based or electronic devices to manage information.
It is simply the number of items that the subject uses to organize information.

This is an aggregate list of the values computed for each participant.

Subject #	Pre			Post		
	Work	Personal	Delta	Work	Personal	Delta
1	6	5	1	6	5	0
2	6	5	1	6	5	1
3	4	4	0	4	4	0
4	5	5	0	5	5	0
5	5	5	0	5	5	0

Overall, each subject initially organized higher WORK and PERSONAL information to approximately the same extent.

But Subjects #1 and 2 were marginally more organized in their WORK-related tasks.

At the end of the study, Subjects #1 and 2 were marginally more organized in their WORK-related tasks.
Subject #4 USED significantly more organizational devices to manage WORK-related information at the end of the study.

Organizational Integration:

Measures the degree to which the subject integrates WORK and PERSONAL information into the same device.

This value is the percentage of tasks that are accomplished using the same device vs. the total number of tasks.

Subject #	Pre		Post	
	Paper	Automated	Paper	Automated
1	0.00%	0.00%	0.00%	0.00%
2	66.67%	0.00%	66.67%	0.00%
3	0.00%	0.00%	0.00%	0.00%
4	0.00%	0.00%	0.00%	0.00%
5	20.00%	0.00%	40.00%	0.00%

This is an aggregate list of the values computed for each participant.

Maximum = 100%

Minimum = 0%

Only two participants integrated WORK and PERSONAL tasks. Neither of them used automated devices to do so.
Subject #2 integrated 2/3 of his tasks using paper-based devices.
Subject #5 integrated 30% of his tasks initially then finished with 40% integrated using paper-based devices.

What tasks do they prefer to automate?

Pre	Task	Post
2	desktop calendar	1
1	date-timer (scheduler)	2
2	"to do" list	2
0	post-it notes ("yellow sticks")	0
0	financial records	4
0	note pad	1
0	other (please specify): Address Book	1

Participants automated financial records more than any other type of information.

7

What are most important things on their desks?

Subject #	Pre	Post
1	Desktop PC	PDA
	Notebook (paper)	Calendar (paper)
	In-Box	In-Box
2	Desktop PC	Desktop PC
	Telephone	Telephone
	Calendar (paper)	Calendar (paper)
3	Calendar (paper)	Calendar (paper)
	Telephone	Telephone
	Desktop PC	Desktop PC
4	Pen	Desktop PC
	Post It notes	Pen
	Pen	PDA
5	Desktop PC	Pen
	Telephone	Telephone

Pre	Post
Desktop PC	5 Desktop PC
Telephone	3 Telephone
Calendar	2 Calendar
Pen	2 PDA
Notebook	1 Pen
In-Box	1 In-Box
Post-It notes	1
	15

This is an aggregate list of all participants' responses.

Before and after the study, the desktop computer was noted by the most participants as being one of the most important items on their desks. The second most noted item was the telephone both before and after. The calendar was initially noted by two subjects. After the study, three noted it. The pen was noted by two subjects both before and after. Only two subjects listed the palmtop after the study.

8 and 10

How do they organize their files?

Pre			Post		
Work	Personal	Method	Work	Personal	
1	1	by project	0	1	
4	4	by topic	5	4	
0	0	by type	0	0	
0	0	by date	0	0	

Most participants organize WORK and PERSONAL files by topic.

9 and 11 How often do they organize their files?

Pre		Method	Post	
Work	Personal		Work	Personal
0	0	once per day	1	1
3	2	a couple times per week	3	1
1	0	once per week	0	0
0	2	a couple times a month	0	2
0	0	once a month	0	0
1	1	hardly ever	1	1
0	0	never	0	0

20 17 Weighted Summation 22 18

Before the study, most participants organized their files a couple times per week.
One subject hardly ever organized Work and Personal files.
In general, participants organized their files more frequently following the study.

Organizational Rating

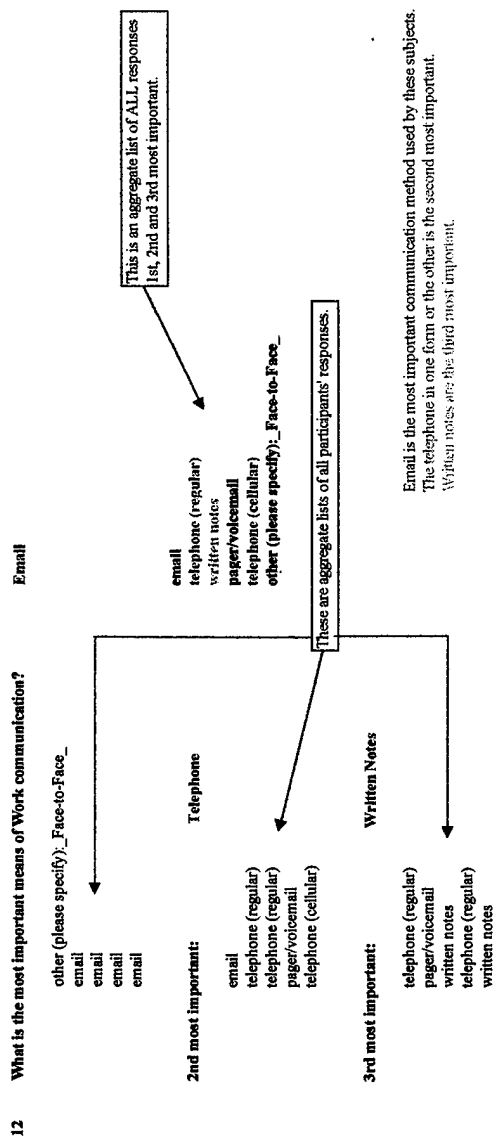
Subject #	Work		Personal	
	Pre	Post	Pre	Post
1	1	1	1	1
2	5	6	5	6
3	3	5	3	3
4	5	5	5	5
5	4	5	3	3

Subject #2 increased the frequency that he organized both his WORK and PERSONAL files by the end of the study.
2 of the 5 participants organized their PERSONAL files less frequently than their WORK files.
Subject #5 increased the frequency that he organized only his WORK files.

Weights

6
5
4
3
2
1
0

Weights are assigned to each response in order to calculate when participants organized their files more frequently.



13 Electronic devices used most often in routine job tasks:

Pre	Electronic Device	Post
1	laptop computer	2
5	desktop computer	5
0	personal digital assistant (PDA)	2
0	cellular phone	0
1	pager	1
5	fax machine	5
0	camera (digital)	1
0	camera (film)	1
0	radio (walkie-talkie)	0
0	other (please specify):	0

Before the study, the desktop computer and fax machine were used by all participants, making them the most commonly used devices. Following the study, they were still the most commonly used devices, but portable computers became more prevalent (2 laptops and 2 PDAs).

15 What devices do most participants own?

Pre	Electronic Device	Post
2	laptop computer	2
3	desktop computer	3
0	personal digital assistant (PDA)	0
2	cellular phone	2
1	pager	1
3	fax machine	3
0	camera (digital)	0
5	camera (film)	5
0	radio (walkie-talkie)	0
1	other (please specify):	1

All participants owned a film-based camera.
Four out of five participants owned a computer.
2 owned laptops.
3 owned desktops.

Do they own both a laptop and a desktop?

Subject #1	Subject #2	Subject #3	Subject #4	Subject #5
0	0	1	0	0

Only one participant owns both a desktop and a laptop computer.

18 What are the most preferred methods of presenting briefs or conducting meetings?

note pad, notebook, loose pages
note pad, notebook, loose pages
computerized presentation software
computerized presentation software
date-book or organizer (paper-based)
date-book or organizer (paper-based)

2 of 5 of participants prefer to use a note pad or notebook
2 of 5 prefer computerized presentation software
and 1 prefers a paper-based date-book or organizer

2nd most preferred:

#N/A
computerized presentation software
date-book or organizer (paper-based)
electronic organizer (PDA, etc.)
note pad, notebook, loose pages

The most mentioned methods are:

- 5 note pad, notebook, loose pages
- 4 computerized presentation software
- 2 date-book or organizer (paper-based)
- 1 electronic organizer (PDA, etc.)

This is a list of the items prioritized by how frequently they were mentioned in the 1st, 2nd and 3rd Preferred lists to the left.

3rd most preferred:

#N/A
#N/A
note pad, notebook, loose pages
note pad, notebook, loose pages
computerized presentation software

This question is a DIRECT indicator of the Subjects' Device Proficiency.

19 Description of the ideal device:					
Size:	Subject #1 carry in pocket	Subject #2 credit card-size	Subject #3 small	Subject #4 pocket-size	Subject #5 palm-size
Data entry:	voice	voice, camera	handwriting	standard keyboard, handwriting	voice, light pen, keyboard
Functions:	- scheduler/calendar w/ alarm - to-do list - address book - note-taker	- word processor - spreadsheet - database - image display (photos) - Internet access - email access	- calendar - notes - calculator - address/contacts	- email - voicemail - spreadsheet - graphs - printing - word processing - file transfer	- word processor - spreadsheet - database - calendar - scheduling - email access - address book
Connectivity:	- synchronize with PC 0 0	- wireless/instant access	- doesn't need to.	- dial-up (land line or cellular). - simple cable connection. - Infrared link	- IR port - built-in cellular modem
Post Functions: - calendar - scheduler - task manager - note pad - word processing - file transfer (to other portable devices)					

Participants generally described the ideal device as:

Pocket-size

Data entry by voice, handwriting (with a stylus) and keyboard

With the following capabilities:

- scheduler/calendar w/ alarm
- to-do list
- address book
- note-taker
- calculator
- printing
- word processor
- spreadsheet
- database
- image display (photos)
- Internet access
- email access
- file transfer

It would connect to other devices:

- synchronize with PC
- wireless/instant access
- dial-up (land line or cellular).
- simple cable connection.
- Infrared link
- built-in cellular modem

Compiled list of all of the above mentioned traits.

22 Software applications that participants have used:

Pre	Software Application	Post
5	Word Processor	5
5	Spreadsheet	5
5	Database	5
5	Calendar/Day-Timer	5
5	Web Browser	5
4	Presentation	4
5	Email	5
2	Contact Management/Address Book	2

All participants have used word processors, spreadsheets, databases, schedulers and email.
Most have used presentation software and only 2 have used contact management or address book software.

23-25 How do they consider themselves?

Pre	Knowledge	Post
0	Very Unknowledgeable	0
0	Somewhat Unknowledgeable	0
2	Somewhat Knowledgeable	2
3	Knowledgeable	3
0	Very Knowledgeable	0

60% of participants evaluated themselves as Knowledgeable of computers.
40% as Somewhat Knowledgeable.

Pre	Proficiency	Post
0	Very Non-proficient	0
0	Somewhat Non-proficient	0
2	Somewhat Proficient	2
2	Proficient	2
1	Very Proficient	1

40% of participants evaluated themselves as Somewhat Proficient with computers.
40% as Proficient.
20% as Very Proficient

Pre	Comfort	Post
0	Very Uncomfortable	0
0	Somewhat Uncomfortable	0
1	Somewhat Comfortable	1
2	Comfortable	2
2	Very Comfortable	2

20% of participants evaluated themselves as Somewhat Comfortable with computers.
40% as Comfortable.
40% as Very Comfortable.

1

Sample Subject

1 When you get to your office, what is the first piece of information you check? (Please indicate only one):

Pre	Item	Post
	daily schedule	
1	"to do" list	
	voicemail and phone messages	
	plan of the day	
	email	1
	headline news from newspapers	
	headline news from web sites	
	headline news from another source	
	other, please specify:	

	1	2
Preference Total	0	0
Proficiency Total	0	0

Each question has a Device Preference Total and a Device Proficiency Total equal to the summation of each response X Preference Value X Proficiency Value.

2 Please list and describe the three most important job-related tasks you do upon arriving at your office:

Prof	Prof	Pre	Prof	Prof	Port
		email			email
		calendar (computer and paper)			calendar (computer and paper)
		to-do list (paper)			to-do list (paper)

Pre	Post
2	2
3	5

(Subjective Evaluation—

Responses are evaluated according to the table on the Survey Summary sheet.

3 What types of work-related information do you need immediate access to throughout the typical work day? (Indicate all that apply):

Pre		Post	
Use	Rank	Item	Rank
1	1	daily schedule	1
1	3	"to do" list	1
1	5	address book	5
1	4	project documents	3
		news headlines	
		financial reports	
1	6	voicemail	
		email	
1	2	world wide web browsing	2
		other (please specify):	4

1	Preference Total	2
1	Proficiency Total	1.75

Preference Total is the summation of items used X Preference Value.

0
0
0
0
0
0
1
1
1

Rank Adjusted values are computed by the following formula:

$$(\text{Use X Preference Value} \times \text{Proficiency Value}) / \text{Rank}$$

	0
	0
	0
	0
	0
	0
	0
	1
	6.73
	0

Rank Adjusted values are computed by the following formula:

$$(\text{Use X Preference Value} \times \text{Proficiency Value}) / \text{Rank}$$

- 4 What types of personal information do you need immediate access to throughout the typical work day? (Indicate all that apply):

Pre	Item	Post
Use Rank		Use Rank
1 1	daily schedule	1 1
1 2	"to do" list	1 2
1 3	address book	1 3
	project documents	
	news headlines	
	financial reports	
	voicemail	
	email	
	world wide web browsing	
	other (please specify):	

Preference Total
Proficiency Total

Preference Total
Proficiency Total

Preference Value	Proficiency Value	Pre Rank Adjusted	Post Rank Adjusted
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
1	2	0	0
1	2	0	0
1	3	0	0

(Subjective)

The summation of Rank Adjusted values produces the measurement of Device Proficiency for this question.

- 5 Please select all of the following items that you utilize regularly. Indicate if you maintain a resources for work-related and/or personal information, if they are in the same or separate objects and please list whether they are paper-based or are automated through your computer (desktop, laptop or PDA - do not indicate type of computer):

Item	Work	Personal	Same	Separate	Paper	Automated
desktop calendar	1	1	1	1	1	1
date/timer (scheduler)	1	1	1	1	1	1
"to do" list	1	1	1	1	1	1
post-it notes ("yellow stickies")	1	1	1	1	1	1
financial records	1	1	1	1	1	1
note pad	1	1	1	1	1	1
other (please specify):						
other (please specify):						
other (please specify):						
Organizational Orientation and Organizational Integration are defined on the Survey Summary.	6	6			33.33%	16.67%
						Org. Integration

Proficiency Value
2
3
2
1
3
1

Organizational Integration is the percentage of all WORK and PERSONAL tasks that the participant accomplishes using the same device for both. For example, this subject utilizes 6 of the items listed for both WORK and PERSONAL tasks. Three are accomplished on the same device (integrated) and three are accomplished on separate devices. Of the three that are integrated, 2 are paper-based and one is automated.
2 paper-based / 6 items total = 33.33%
1 automated / 6 items total = 16.67%
= Summation (Same X Automated) / (Same + Automated)
= Summation (Same X Paper) / (Same + Automated)

Item	Work	Personal	Same	Separate	Paper	Automated
desktop calendar	1	1	1	1	1	1
date/timer (scheduler)	1	1	1	1	1	1
"to do" list	1	1	1	1	1	1
post-it notes ("yellow stickies")	1	1	1	1	1	1
financial records	1	1	1	1	1	1
note pad	1	1	1	1	1	1
other (please specify):						
other (please specify):						
other (please specify):						
Address Book	1	1	1	1	1	1
Sum of Work or Sum of Personal tasks	6	6			6.00%	33.33%
						Org. Integration

Proficiency Value
2
3
2
1
3
1

6 How do you remind yourself of what you need to do during the day?

Pre	Item	Post
	I don't keep reminders	
	"to do" list on a paper-based planner	1
1	"to do" list on a desktop computer	
	"to do" list on an electronic organizer	1
	"to do" list on a dry erase/chalk board	
1	post-it notes ("yellow stickies")	1
	string around finger or rubber band	
	pocket voice recorder or recording pen	
	other (please specify):	
	other (please specify):	

1	Preference Total	1
2	Proficiency Total	2

Performance Value

0
0
1
1
0
0
0
0
1

Proficiency Value

0
0
2
2
0
0
0
0
1

The values in Red Subjective Proficiency Value Boxes are entered by hand after analysis of the response. The response is evaluated and assigned a Proficiency Value based on the Rating Scale found on the Survey Summary Sheet.

7 What are the three most often used things on your desk?

Pre	Proficiency Value
	Desktop PC
	Notebook (paper)
	In-Box

1	Preference Total	1
4	Proficiency Total	5

Post-Proficiency Value

PDA
Pen
In-Box

Preference Value	Post
1	1
0	0
0	0

(Automatically Computed)

These Preference Values are automatically generated based on the Proficiency Values entered to the left.

8 How do you organize your work files?

Pre	Item	Post
	by project	
1	by topic	1
	by type	
	by date	
	other	

No Device Preference
or
Device Proficiency
from this Question

Questions 8 through 11 are designed to provide data concerning the subjects' organizational methods in both their WORK and PERSONAL lives. Organizational Orientation values from question #5 and Organizational Ratings from Questions #9 and 11 provide a better understanding of the degree to which the subject organizes both WORK and PERSONAL information.

14 Which of the following electronic devices have you used in your job? (past or present):

Pre	Item	Post
1	laptop computer	1
1	desktop computer	1
1	personal digital assistant (PDA)	1
1	cellular phone	1
1	pager	1
1	fax machine	1
1	camera (digital)	1
1	camera (film)	1
1	radio (walkie-talkie)	1
1	other (please specify):	1

Preference Total 7
Proficiency Total 23

Proficiency Value

5
4
5
3
2
2
3
1
1
2

Preference Value

1
1
1
1
1
1
1
1
1
1

This question determines the technological complexity of ALL of the subject's jobs and whether or not the individual is inclined to make use of technological devices.

15 Which of the following electronic devices do you currently own?

Pre	Item	Post
1	laptop computer	1
1	desktop computer	1
1	personal digital assistant (PDA)	1
1	cellular phone	1
1	pager	1
1	fax machine	1
1	camera (digital)	1
1	camera (film)	1
1	radio (walkie-talkie)	1
1	other (please specify): Cam-Corder	1

Preference Total 9
Proficiency Total 5

Proficiency Value

5
4
5
3
2
2
3
1
1
2

Preference Value

1
1
1
1
1
1
1
1
1
1

This question seeks data regarding the individual's preference for and proficiency with electronic devices in daily life.

Sample Subject

12

How do you communicate with people in job-related activities? (indicate all that apply in the "USE" column and then rank them in the "RANK" column with 1 being most important):

Use	Rank	Means of Communication	Use	Rank
		video teleconferencing		
1	3	email	1	2
		pager/voicemail		
1	5	telephone (cellular)	1	4
1	2	telephone (regular)	1	3
		radio (walkie-talkie)		
1	4	written notes	1	5
1	1	other (please specify): Face-to-Face	1	1

Preference Total	2.92
Proficiency Total	

This subject entered a means of communication that was evaluated according to the Rating Scale and assigned appropriate Preference and Proficiency Values.

Preference Value	Proficiency Value
1	5
1	3
1	2
1	3
1	2
1	2
0	0

Pre Rank Adjusted	Post Rank Adjusted
0	0
0	1.5
0	0
0.6	0.75
1	0.6666667
0	0
0	0
0	0

Rank Adjusted values are computed the same as in Questions #3 and 4.

This question determines the relative importance of each means of communication used by each Subject.

13

Which of the following electronic devices do you currently use routinely in your job?

Pre	Item	Post
1	laptop computer	1
	desktop computer	
	personal digital assistant (PDA)	
	cellular phone	
	pager	
1	fax machine	1
	camera (digital)	
	camera (film)	
	radio (walkie-talkie)	
	other (please specify):	

Preference Total	4
Proficiency Total	14

Preference Value	Proficiency Value
1	5
1	4
1	5
1	3
1	2
1	2
1	3
1	1
1	2

This question helps determine the technological complexity of the subject's CURRENT job and whether or not the individual utilizes technological devices to assist in tasks.

9 How often do you organize your work-related files?

Pre	Item	Post
	once per day	
	a couple times per week	1
	once per week	
1	a couple times a month	
	once a month	
	hardly ever	
	never	
	other (please specify):	

No Device Preference
or
Device Proficiency
from this Question

Organizational Rating
Pre 3
Post 5

10 How do you organize your personal files?

Pre	Item	Post
	by project	
1	by topic	1
	by type	
	by date	
	other	

No Device Preference
or
Device Proficiency
from this Question

The Organizational Rating is computed based on the participant's response. "Never" receives a value of 0. This is incremented up to 6 for "Once per day."

11 How often do you organize your personal files?

Pre	Item	Post
	once per day	
	a couple times per week	
	once per week	
	a couple times a month	1
1	once a month	
	hardly ever	
	never	
	other (please specify):	

No Device Preference
or
Device Proficiency
from this Question

Organizational Rating
Pre 2
Post 3

Sample Subject

16 Which of the following electronic devices have you owned previously but do not any longer?

Pre	Item	Post
1	laptop computer	1
	desktop computer	
	personal digital assistant (PDA)	
1	cellular phone	1
	pager	
	fax machine	
	camera (digital)	
	camera (film)	
1	radio (walkie-talkie)	1
	other (please specify):	
3	Preference Total	3
10	Proficiency Total	10

Preference Value

1
1
1
1
1
1
1
1
1
1
1

Proficiency Value

5
4
5
3
2
2
3
1
2

This question seeks data regarding the individual's general inclination to make use of electronic devices in daily life.

17 Why do you no longer use the devices you indicated above?

Pre	Post
Bought faster desktop and stopped using laptop while traveling.	
Cellular Phone - too expensive.	
Used CB radio when traveling a lot. Don't travel as much now.	
	SAME

This question is used to determine the reason for no longer using the devices indicated above. Used to determine if it was abandoned due to complexity or a change in lifestyle/needs.

As you conduct a meeting or present a brief in your job, what materials do you prefer to use for your notes? (Indicate all applicable in the "USE" column and then rank these in order of preference in the "RANK" column being your first choice):

Pre		Media for Keeping Meeting Notes		Post	
Use	Rank		Notes	Use	Rank
1	2		note pad, notebook, loose pages	1	2
			scraps of paper (napkin, envelope)		
			index cards		
			date-timer or organizer (paper-based)		
1	1		computerized presentation software	1	1
			electronic organizer (PDA, etc.)	1	3
			other (please specify):		
			other (please specify):		
			other (please specify):		

Preference Total
Proficiency Total

2 3.67

19 If an ideal device was available that could assist you in your job, what would it do?

Preference Value	Proficiency Value	Pre Rank Adjusted	Post Rank Adjusted
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
1	4	4	4
1	5	0	1.6446657
		0	0
		0	0
		0	0

This is one of the most informative questions of the survey, but it does not necessarily provide quantifiable data. Responses to this question clarify the needs of Naval officers for a device that will assist them in their professional lives.

Responses may also indicate the individual's technological knowledge, thus contributing to the evaluation of Device Proficiency.

- scheduler/calendar w/ alarm
- to-do list
- address book
- note-taker
- checkbook manager
- rugged enough to sit on
- integrated cellular phone

How does it work with other devices?:

- synchronize calendar and contacts with PC
- IR port to transfer files and messages
- Ethernet connection to network
- built-in cellular access for data and voice

Post	
How big or small is it?:	
How do you enter data?:	
Functions?:	SAME
How does it work with other devices?:	

Sample Subject

- 20 Imagine that everybody in your organization has the device you just described. How would that change your approach to meetings and routine job tasks?

Pre
<p>Make it more efficient</p> <p>Presentations done directly from device</p> <p>Decrease meeting preparation time</p> <p>Planning for meetings could be coordinated without having to have a meeting to pain the meeting!</p>

Post
SAME

Like the previous question, responses to this question clarify the needs of Naval officers for a device that will assist them in their professional lives.

Responses may also indicate the individual's technological knowledge, thus contributing to the evaluation of Device Proficiency.

- 21 Imagine the following scenarios:

- a. You are passing a work associate in the passageway. She asks if you knew about a meeting scheduled for later in the week. You were not aware of the meeting. What do you do next? How do you plan to recall the meeting time and location?

Pre
<p>Write it down in my date-timer.</p>
<p>Preference Total</p> <p>Proficiency Total</p>

Post
Enter it in PDA's calendar.

The scenarios presented in the various parts of this question are common real-life events. Subjects' responses directly indicate the individual's willingness to utilize technological devices to assist with such information management tasks.

These responses are evaluated by hand based on the Device Proficiency Rating Scale.

Sample Subject

- b. While having lunch, you see someone you had known at a previous duty station. You ask for his phone number or address in order to stay in touch. What do you do next? How do you plan to record the phone number or address?

Pre	Write it on a scrap of paper or ask him to email it to me.	Post
	Enter it into computer's address book later.	
Preference Total		
Proficiency Total		

Post
Enter into PDA's contact list.

- c. While in a Department Head meeting your Commanding Officer asks you for information that you do not have with you. You know this information is on your desktop computer and is easily available from any networked computer. There are network connections throughout the meeting room. What do you do next? How do you plan to retrieve the desired information? Would you be comfortable with getting up from the table to access one of the network connections? Why?

Pre	Request permission to use the nearest networked computer to access information.	Post
Preference Total		
Proficiency Total		

Post
SAME

Sample Subject

- d. You have just been called to a meeting that is to start in a half hour. No other information regarding the meeting is available. What do you do next? What information and in what form do you prepare to take with you?

Pre	Post
Paper notebook	Palantop - use it in place of the date-timer and notebook.
Date-timer (paper-based)	But current project notes are still compiled on paper.
Notes regarding current projects	

Pre Preference Total
Post Proficiency Total

- 22 Please indicate all of the following software applications you have used:

Pre	Software Application	Post
1	Word Processor	1
1	Spreadsheet	1
1	Database	1
1	Calendar/Day-Timer	1
1	Web Browser	1
1	Presentation	1
1	Email	1
1	Contact Management/Address Book	1
Pre	Preference Total	Post
8	Proficiency Total	8

Preference Value	Proficiency Value
1	2
1	4
1	5
1	2
1	3
1	4
1	2
1	2

This question helps determine the individual's technological background. The more applications indicated, the more familiar the subject is believed to be with computer technology. Therefore, a higher Device Proficiency Rating.

- 23 Regarding my knowledge of computers, I consider myself to be:

Pre	Knowledgeable	Post
	Very Unknowledgeable	
	Somewhat Unknowledgeable	
1	Somewhat Knowledgeable	1
	Knowledgeable	
	Very Knowledgeable	
Pre	Preference Total	Post
1	Proficiency Total	1

Preference Value	Proficiency Value
0	
1	
3	
4	
5	

The final three questions ask the subject to evaluate him/herself in areas regarding computer technology. Responses help to better evaluate the individual's Device Proficiency.

24 Regarding my proficiency with computers, I consider myself to be:

Pre	Proficiency	Post
	Very Non-Proficient	
	Somewhat Non-Proficient	
1	Somewhat Proficient	1
	Proficient	
	Very Proficient	
Pre	Proficiency Total	Post
3		3

Proficiency Value
0
1
3
4
5

25 Regarding my comfort with using computers, I consider myself to be:

Pre	Comfortable	Post
	Very Uncomfortable	
	Somewhat Uncomfortable	
1	Somewhat Comfortable	1
	Comfortable	
	Very Comfortable	
Pre	Preference Total	Post
3		3

Preference Value
0
1
3
4
5

Subject # 1 Survey Results

Total Device Preference

Pre Post
32 50

Total Device Proficiency

Pre Post
31.5 32.5

Summation of Device Preference Totals for individual questions

Summation of Device Proficiency Totals for individual questions

NPS-SOPCP Survey Responses for Subject # 1

1 When you get to your office, what is the first piece of information you check? (Please indicate only one):

Pre	Item	Post	Preference Value	Proficiency Value
1	daily schedule	1	0	0
	"to do" list		0	0
	voicemail and phone messages		1	2
	plan of the day		0	0
	email		1	2
	headline news from newspapers		0	0
	headline news from web sites		1	3
	headline news from another source			
	other, please specify: _____			

	Preference Total	Proficiency Total
1. Mathematics	10	10
2. Science	10	10
3. Reading	10	10
4. Writing	10	10
5. History	10	10
6. Art	10	10
7. Music	10	10
8. Physical Education	10	10
9. Foreign Language	10	10
10. Health	10	10
11. Life Skills	10	10
12. Character Education	10	10
13. Technology	10	10
14. Environmental Studies	10	10
15. Other	10	10
Total	150	150

2 **Please list and describe the three most important job-related tasks you do upon arriving at your office:**

Prof	Prof	Pre	Prof	Prof	Post
	email				email
	calendar (computer and paper)				calendar (computer and paper)
	to-do list (paper)				to-do list (paper)

Pre	Post
2	2
5	5

3 What types of work-related information do you need immediate access to throughout the typical work day? (Indicate all that apply):

Pre			Post		
Use	Rank	Item	Use	Rank	Item
1	1	daily schedule	1	1	
1	3	"to do" list	1	3	
1	5	address book	1	5	
1	4	project documents	1	4	
		news headlines			
1	6	financial reports	1	6	
		voicemail			
1	2	email	1	2	
1	7	world wide web browsing	1	7	
		other (please specify):			

2	2	143
Preference Total		
Proficiency Total		

- 4 What types of personal information do you need immediate access to throughout the typical work day? (Indicate all that apply):

Pre	Use Rank	Item	Post	Use Rank
1	1	daily schedule	1	1
1	2	"to do" list	1	2
1	3	address book	1	3
		project documents		
		news headlines		
		financial reports		
		voicemail		
		email		
		world wide web browsing		
		other (please specify):		

Preference Total
 Proficiency Total

Preference Value	Proficiency Value	Pre Rank Adjusted	Post Rank Adjusted
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
1	2	0	0
1	2	0	0
1	3	0	0

(Subjective)

- 5 Please select all of the following items that you utilize regularly. Indicate if you maintain a resources for work-related and/or personal information, if they are in the same or separate objects and please list whether they are paper-based or are automated through your computer (desktop, laptop or PDA - do not indicate type of computer):

PRE:

Item	Work	Personal	Same	Separate	Paper	Automated
desktop calendar	1	1		1	1	1
date-imer (scheduler)	1	1		1	1	1
"to do" list	1	1	1	1	1	1
post-it notes ("yellow stickies")	1	1	1	1	1	1
financial records	1	1	1	1	1	1
note pad	1	1	1	1	1	1
other (please specify):						
other (please specify):						
other (please specify):						
Org. Orientation	6	5			0.00%	0.00%

Proficiency Value
2
3
2
1
3
1

Preference Total:

Proficiency Total:

POST:

Item	Work	Personal	Same	Separate	Paper	Automated
desktop calendar	1	1		1	1	1
date/imer (scheduler)	1	1		1	1	1
"to do" list	1	1	1	1	1	1
post-it notes ("yellow stickies")	1	1	1	1	1	1
financial records	1	1	1	1	1	1
note pad	1	1	1	1	1	1
other (please specify): Address Book	1	1	1	1	1	1
other (please specify):						
other (please specify):						
Org. Orientation	6	6			0.00%	0.00%

Proficiency Value
2
3
2
1
3
1

Preference Total:

Proficiency Total:

Subject #1

6 How do you remind yourself of what you need to do during the day?

Pre	Item	Post
	I don't keep reminders	
1	"to do" list on a paper-based planner	1
	"to do" list on a desktop computer	
	"to do" list on an electronic organizer	1
	"to do" list on a dry erase/chalk board	
1	post-it notes ("yellow stickies")	1
	string around finger or rubber band	
	pocket voice recorder or recording pen	
	other (please specify):	
	other (please specify):	

1	2
Preference Total	Preference Total
Proficiency Total	Proficiency Total

0	0
0	0
1	1
1	1
0	0
0	0
0	0
1	1

0	0
0	0
2	2
2	2
0	0
0	0
0	0
1	1

7 What are the three most often used things on your desk?

Pre	Proficiency Value
1	Desktop PC
1	Notebook (paper)
1	In-Box

1	2
Preference Total	Preference Total
Proficiency Total	Proficiency Total

Post	Proficiency Value
1	PDA
1	Calendar (paper)
1	In-Box

Preference Value	Pre	Post
1	1	1
0	0	0
0	0	0

(Automatically Computed)

8 How do you organize your work files?

Pre	Item	Post
	by project	
1	by topic	1
	by type	
	by date	
	other	

No Device Preference
or
Device Proficiency
from this Question

Subject #1

9 How often do you organize your work-related files?

Pre	Item	Post
	once per day	
	a couple times per week	
	once per week	
	a couple times a month	
	once a month	
1	hardly ever	1
	never	
	other (please specify):	

No Device Preference
or
Device Proficiency
from this Question

Organizational Rating
Pre 1
Post 1

10 How do you organize your personal files?

Pre	Item	Post
	by project	
1	by topic	1
	by type	
	by date	
	other	

No Device Preference
or
Device Proficiency
from this Question

11 How often do you organize your personal files?

Pre	Item	Post
	once per day	
	a couple times per week	
	once per week	
	a couple times a month	
	once a month	
1	hardly ever	1
	never	
	other (please specify):	

No Device Preference
or
Device Proficiency
from this Question

Organizational Rating
Pre 1
Post 1

Subject #1

12

How do you communicate with people in job-related activities? (Indicate all that apply in the "USE" column and then rank them in the "RANK" column with 1 being most important):

[illegible]

13 Which of the following electronic devices do you currently use routinely in your job?

Pre		Item	Post	Proficiency Value
		laptop computer		5
1		desktop computer	1	4
		personal digital assistant (PDA)	1	5
		cellular phone	1	3
		pager	1	2
1		fax machine	1	2
		camera (digital)	1	3
		camera (film)	1	1
		radio (walkie-talkie)	1	2
		other (please specify) _____		
2		Preference Total	1	
6		Proficiency Total	1	

14 Which of the following electronic devices have you used in your job? (past or present):

Pre	Item	Post
1	laptop computer	1
1	desktop computer	1
	personal digital assistant (PDA)	1
1	cellular phone	1
1	pager	1
1	fax machine	1
	camera (digital)	
	camera (film)	
	radio (walkie-talkie)	
	other (please specify):	

Preference Value
1
1
1
1
1
1
1
1
1
1

Proficiency Value
5
4
5
3
2
2
3
1
1
2

5	Preference Total	6
16	Proficiency Total	21

15 Which of the following electronic devices do you currently own?

Pre	Item	Post
	laptop computer	
	desktop computer	
	personal digital assistant (PDA)	
	cellular phone	
	pager	
	fax machine	
	camera (digital)	
1	camera (film)	1
	radio (walkie-talkie)	
	other (please specify):	

Preference Value
1
1
1
1
1
1
1
1
1
1

Proficiency Value
5
4
5
3
2
2
3
1
1
2

1	Preference Total	1
1	Proficiency Total	1

16 Which of the following electronic devices have you owned previously but do not any longer?

Pre	Item	Post
1	laptop computer	1
1	desktop computer	1
	personal digital assistant (PDA)	
1	cellular phone	1
	pager	
	fax machine	
	camera (digital)	
1	camera (film)	1
	radio (walkie-talkie)	
	other (please specify):	

Preference Value	Proficiency Value
1	5
1	4
1	5
1	3
1	2
1	2
1	3
1	1
1	2

4	Preference Total	4
13	Proficiency Total	13

17 Why do you no longer use the devices you indicated above?

Pro	Post
Laptop was a 286 - don't need one now.	
Desktop was destroyed in PCS move, plan to replace.	SAME
Cellular Phone - No longer needed.	

[illegible]

19 If an ideal device was available that could assist you in your job, what would it do?

Pre	Post
How big or small is it?: carry in pocket	How big or small is it?:
How do you enter data?: voice	How do you enter data?:
Functions?: - scheduler/calendar w/ alarm - to-do list - address book - note-taker	Functions?: SAME
How does it work with other devices?: - synchronize with PC	How does it work with other devices?:

- 20 Imagine that everybody in your organization has the device you just described. How would that change your approach to meetings and routine job tasks?

<p>Pre</p> <p>Make it more efficient</p> <p>Presentations done directly from device</p> <p>Decrease meeting preparation time</p>	<p>Post</p> <p>SAME</p>
--	-------------------------

- 21 Imagine the following scenarios:

- a. You are passing a work associate in the passageway. She asks if you knew about a meeting scheduled for later in the week. You were not aware of the meeting. What do you do next? How do you plan to recall the meeting time and location?

<p>Pre</p> <p>Write it down and pass it on to the secretary who will schedule it.</p>	<p>Post</p> <p>Enter it in PDA's calendar and then pass to secretary.</p> <p>Set alarm.</p>
---	---

<p>Preference Total</p> <p>Proficiency Total</p>	<p>Pre</p> <p>Post</p>
--	------------------------

- b. While having lunch, you see someone you had known at a previous duty station. You ask for his phone number or address in order to stay in touch. What do you do next? How do you plan to record the phone number or address?

Pre		Post
	Write it on a napkin. Copy to paper-based address book later.	
Preference Total		Proficiency Total

Post
Enter into PDA's contact list.

- c. While in a Department Head meeting your Commanding Officer asks you for information that you do not have with you. You know this information is on your desktop computer and is easily available from any networked computer. There are network connections throughout the meeting room. What do you do next? How do you plan to retrieve the desired information? Would you be comfortable with getting up from the table to access one of the network connections? Why?

Pre		Post
	Go to nearest networked computer and retrieve info. No discomfort unless CO would object to it.	
Preference Total		Proficiency Total

Post
SAME

Subject #1

- d. You have just been called to a meeting that is to start in a half hour. No other information regarding the meeting is available. What do you do next? What information and in what form do you prepare to take with you?

Pre	Paper notebook Navy Leader Planning Guide (calendar)	Post	Palmtop - but would be better if palmtop's schedule program (Outlook) synchronized with desktop's (Groupwise). SAME
Pre	Preference Total Proficiency Total	Post	

- 22 Please indicate all of the following software applications you have used:

Pre	Software Application	Post	Preference Value	Proficiency Value
1	Word Processor	1	1	2
1	Spreadsheet	1	1	4
1	Database	1	1	5
1	Calendar/Day-Timer	1	1	2
1	Web Browser	1	1	3
1	Presentation	1	1	4
1	Email	1	1	2
1	Contact Management/Address Book	1	1	2
Pre	Preference Total	Post		
6	Proficiency Total	13		

- 23 Regarding my knowledge of computers, I consider myself to be:

Pre	Knowledgeable	Post	Proficiency Value
	Very Unknowledgeable		0
	Somewhat Unknowledgeable		1
1	Somewhat Knowledgeable	1	3
	Knowledgeable		4
	Very Knowledgeable		5
Pre	Preference Total	Post	
3	Proficiency Total	3	

24 Regarding my proficiency with computers, I consider myself to be:

Pre	Proficiency	Post
	Very Non-Proficient	
	Somewhat Non-Proficient	
1	Somewhat Proficient	1
	Proficient	
	Very Proficient	
Pre	Proficiency Total	Post
3		3

Proficiency Value
0
1
3
4
5

25 Regarding my comfort with using computers, I consider myself to be:

Pre	Comfortable	Post
	Very Uncomfortable	
	Somewhat Uncomfortable	
1	Somewhat Comfortable	1
	Comfortable	
	Very Comfortable	
Pre	Preference Total	Post
3		3

Preference Value
0
1
3
4
5

Subject # 1 Survey Results

Total Device Preference	Pre	Post
	34	39
Total Device Proficiency	Pre	Post
	33.3	31.5

Subject #2

- 4 What types of personal information do you need immediate access to throughout the typical work day? (Indicate all that apply):

Pre	Use	Rank	Item	Post
1	1	2	daily schedule	1
1	1	1	"to do" list	1
1	1	3	address book	1
			project documents	3
			news headlines	
			financial reports	
			voicemail	
			email	
			world wide web browsing	
			other (please specify):	

Preference Value	Proficiency Value	Pre Rank, Adjusted	Port Rank, Adjusted
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
1	2	0	0
1	2	0	0
1	3	0	0

(Subjective)

0	0	Preference Total	0	0
0	0	Proficiency Total	0	0

- Please select all of the following items that you utilize regularly. Indicate if you maintain a resources for work-related and/or personal information, if they are in the **same** or **separate** objects and please list whether they are **paper-based** or are **automated** through your computer (desktop, laptop or PDA - do not indicate type of computer):

PRE:

Preference	1
Total:	
Proficiency	3
Total:	

Item	Work	Personal	Same	Separate	Paper	Automated
desktop calendar	1	1	1	1	1	1
date/timer (scheduler)	1	1	1	1	1	1
"to do" list	1	1	1	1	1	1
post-it notes ("yellow stickies")	1	1	1	1	1	1
financial records	1	1	1	1	1	1
note pad	1	1	1	1	1	1
other (please specify):						
other (please specify):						
other (please specify):						
	5	5			86.87%	8.00%
	Ovs. Orientation				Ovs. Integration	

2
3
2
1
3
1

POST:

Preference **1**

Total:

Proficiency **3**

Total:

Item	Work	Personal	Same	Separate	Paper	Automated
desktop calendar	1	1	1		1	1
date/timer (scheduler)	1	1	1		1	
"to do" list	1	1	1	1		
post-it notes ("yellow stickies")	1	1	1		1	
financial records	1			1		1
note pad	1	1	1	1	1	
other (please specify):						
other (please specify):						
other (please specify):						
	6	5			66.67%	8.00%
					Over Information	

2
3
2
1
3
1

6 How do you remind yourself of what you need to do during the day?

Pre	Item	Post
1	I don't keep reminders	1
	"to do" list on a paper-based planner	1
	"to do" list on a desktop computer	1
	"to do" list on an electronic organizer	
	"to do" list on a dry erase/chalk board	
	post-it notes ("yellow stickies")	
	string around finger or rubber band	
	pocket voice recorder or recording pen	
	other (please specify):	
	other (please specify):	
	other (please specify):	

Preference Total	1
Proficiency Total	2

Performance Value	Proficiency Value
0	0
0	0
1	2
1	2
0	0
0	0
0	0
1	1

7 What are the three most often used things on your desk?

Pre	Proficiency Value
2	Desktop PC
6	Telephone
	Calendar (paper)

Post	Proficiency Value
2	Desktop PC
6	Telephone
	Calendar (paper)

Preference Value	Post
1	1
1	1
0	0

(Automatically Computed)

8 How do you organize your work files?

Pre	Item	Post
1	by project	1
	by topic	
	by type	
	by date	
	other	

No Device Preference
or
Device Proficiency
from this Question

Subject #2

9 How often do you organize your work-related files?

Pre	Item	Post
	once per day	1
1	a couple times per week	
	once per week	
	a couple times a month	
	once a month	
	hardly ever	
	never	
	other (please specify):	

No Device Preference
or
Device Proficiency
from this Question

Organizational Rating
Pre 5
Post 6

10 How do you organize your personal files?

Pre	Item	Post
	by project	
1	by topic	1
	by type	
	by date	
	other	

No Device Preference
or
Device Proficiency
from this Question

11 How often do you organize your personal files?

Pre	Item	Post
	once per day	1
1	a couple times per week	
	once per week	
	a couple times a month	
	once a month	
	hardly ever	
	never	
	other (please specify):	

No Device Preference
or
Device Proficiency
from this Question

Organizational Rating
Pre 5
Post 6

Subject #2

- 12 How do you communicate with people in job-related activities? (Indicate all that apply in the "USE" column and then rank them in the "RANK" column with 1 being most important):

Pre	Post	Use Rank	Rank	Post Rank	Adjusted	Post Rank	Adjusted
		video teleconferencing	1	1			
1	1	email	1	3			
1	3	pager/voicemail	1	3			
		telephone (cellular)	1				
1	2	telephone (regular)	1	2			
		radio (walkie-talkie)	2				
1	4	written notes	1	4			
		other (please specify):					
3	3	Preference Total					
4.67	4.67	Proficiency Total					

- 13 Which of the following electronic devices do you currently use routinely in your job?

Pre	Post	Item	Post	Proficiency Value	Post Rank	Adjusted	Post Rank	Adjusted
		laptop computer	1	1				
1	1	desktop computer	1	1				
		personal digital assistant (PDA)		1				
		cellular phone		1				
		pager		1				
1	1	fax machine	1	1				
		camera (digital)		1				
		camera (film)		1				
		radio (walkie-talkie)		1				
		other (please specify):		1				
2	2	Preference Total						
5	5	Proficiency Total						

Subject #2

14 Which of the following electronic devices have you used in your job? (past or present):

Pre	Item	Post
1	laptop computer	1
1	desktop computer	1
1	personal digital assistant (PDA)	1
	cellular phone	
	pager	1
1	fax machine	1
1	camera (digital)	1
	camera (film)	
1	radio (walkie-talkie)	1
	other (please specify):	

Preference Value
1
1
1
1
1
1
1
1
1
1
1

Proficiency Value
5
4
5
3
2
2
3
1
1
2

6	Preference Total	7
21	Proficiency Total	23

15 Which of the following electronic devices do you currently own?

Pre	Item	Post
1	laptop computer	1
	desktop computer	
	personal digital assistant (PDA)	
	cellular phone	
	pager	
1	fax machine	1
	camera (digital)	
1	camera (film)	1
	radio (walkie-talkie)	
	other (please specify):	

Preference Value
1
1
1
1
1
1
1
1
1
1

Proficiency Value
5
4
5
3
2
2
3
1
1
2

3	Preference Total	3
7	Proficiency Total	7

Subject #2

16 Which of the following electronic devices have you owned previously but do not any longer?

Pre	Item	Post
1	laptop computer	1
1	desktop computer	1
	personal digital assistant (PDA)	1
	cellular phone	
	pager	
1	fax machine	1
	camera (digital)	
1	camera (film)	1
1	radio (walkie-talkie)	1
	other (please specify):	

5	Preference Total	5
14	Proficiency Total	14

Proficiency Value
5
4
5
3
2
2
3
1
2

Preference Value
1
1
1
1
1
1
1
1
1
1

17 Why do you no longer use the devices you indicated above?

Pre	Post
PDA - kept losing data, unreliable	(SAME)
Walkie-talkie - no longer needed	

Subject #2

- 18 As you conduct a meeting or present a brief in your job, what materials do you prefer to use for your notes? (indicate all applicable in the "USE" column and then rank these in order of preference in the "RANK" column 1 being your first choice):

Pre	Post	Media for Keeping Meeting Notes	Use	Rank
1	1	note pad, notebook, loose pages	1	1
		scraps of paper (napkin, envelope)		
		index cards		
		date-timer or organizer (paper-based)		
1	2	computerized presentation software	1	2
		electronic organizer (PDA, etc.)		
		other (please specify):		
		other (please specify):		

Preference Total	1
Proficiency Total	2

Preference Value	0
Proficiency Value	0
Pre Rank Adjusted	0
Post Rank Adjusted	0

- 19 If an ideal device was available that could assist you in your job, what would it do?

Pre

How big or small is it?:
credit card-size

How do you enter data?:
voice, camera

Functions?:
- word processor
- spreadsheet
- database
- image display (photos)
- Internet access
- email access

How does it work with other devices?:
- wireless/instant access

Post

How big or small is it?:
SAME

How do you enter data?:
SAME

Functions?:
SAME

How does it work with other devices?:
SAME

- 20 Imagine that everybody in your organization has the device you just described. How would that change your approach to meetings and routine job tasks?

Pre	
	saves time by voice recognition (data entry)
	note taking by voice input
	wireless/instant communication

Post	
	saves time by voice recognition (data entry)
	note taking by voice input
	wireless/instant communication
	voice to text option

- 21 Imagine the following scenarios:

- a. You are passing a work associate in the passageway. She asks if you knew about a meeting scheduled for later in the week. You were not aware of the meeting. What do you do next? How do you plan to recall the meeting time and location?

Pre	
	write down the meeting time and place in my notebook calendar when I return to office.

Pre	Preference Total	Post
	Proficiency Total	

Post	
	enter the meeting time and place in my PDA calendar.

- b. While having lunch, you see someone you had known at a previous duty station. You ask for his phone number or address in order to stay in touch. What do you do next? How do you plan to record the phone number or address?

Pre	Post
write it down on a piece of paper. transfer it to paper-based address book when when I return to office.	
Preference Total Proficiency Total	

Post
SAME

- c. While in a Department Head meeting your Commanding Officer asks you for information that you do not have with you. You know this information is on your desktop computer and is easily available from any networked computer. There are network connections throughout the meeting room. What do you do next? How do you plan to retrieve the desired information? Would you be comfortable with getting up from the table to access one of the network connections? Why?

Pre	Post
Tell CO, "I'll get back with you." Most "foreign" computers seem to block me out of my own files - wasting time.	
Preference Total Proficiency Total	

Post
SAME

Subject #2

- d. You have just been called to a meeting that is to start in a half hour. No other information regarding the meeting is available. What do you do next? What information and in what form do you prepare to take with you?

Pre	Make additional phone calls to determine meeting topic. Take calendar, phone POCs, meeting notebook.	Post	SAME
Preference Total		Proficiency Total	

- 22 Please indicate all of the following software applications you have used:

Pre	Software Application	Post	Proficiency Value
1	Word Processor	1	2
1	Spreadsheet	1	4
1	Database	1	5
1	Calendar/Day-Timer	1	2
1	Web Browser	1	3
1	Presentation	1	4
1	Email	1	2
1	Contact Management/Address Book	1	2
Preference Total			
Proficiency Total			

- 23 Regarding my knowledge of computers, I consider myself to be:

Pre	Knowledgeable	Post	Proficiency Value
	Very Unknowledgeable		0
	Somewhat Unknowledgeable		1
	Somewhat Knowledgeable		3
1	Knowledgeable	1	4
	Very Knowledgeable		5
Preference Total			
Proficiency Total			

24 Regarding my proficiency with computers, I consider myself to be:

Proficiency		Proficiency Value	
Pre	Post	0	
	Very Non-Proficient	1	
	Somewhat Non-Proficient	3	
	Somewhat Proficient	4	
1	Proficient	5	
	Very Proficient		
Pre	Post		
4	6		
Proficiency Total			

25 Regarding my comfort with using computers, I consider myself to be:

Comfortable		Preference Value	
Pre	Post	0	
	Very Uncomfortable	1	
	Somewhat Uncomfortable	3	
	Somewhat Comfortable	4	
	Comfortable	5	
1	Very Comfortable		
Pre	Post		
5	5		
Preference Total			

Subject # 2	
Survey Results	
Total Device Preference	Pre Post 41 44
Total Device Proficiency	Pre Post 103 112

- 4 What types of personal information do you need immediate access to throughout the typical work day? (Indicate all that apply):

Pre	Use Rank	Item	Post	Use Rank
1	2	daily schedule	1	3
1	3	"to do" list	1	2
1	4	address book	1	4
		project documents		
		news headlines		
1	5	financial reports	1	5
		voicemail		
1	1	email	1	1
		world wide web browsing		
		other (please specify):		

Preference Value

0
0
0
0
0
0
1
1
1
1

Proficiency Value

0
0
0
0
0
0
2
2
2
3

Pre Rank Adjusted

0
0
0
0
0
0
0
2
2
0

Post Rank Adjusted

0
0
0
0
0
0
0
2
2
0

1	Preference Total	1
2	Proficiency Total	2

- 5 Please select all of the following items that you utilize regularly. Indicate if you maintain a resources for work-related and/or personal information, if they are in the same or separate objects and please list whether they are paper-based or are automated through your computer (desktop, laptop or PDA - do not indicate type of computer):

PRE:

Item	Work	Personal	Same	Separate	Paper	Automated
desktop calendar	1	1		1	1	
date/limer (scheduler)	1	1	1	1	1	
"to do" list	1	1	1	1	1	
post-it notes ("yellow stickies")	1	1	1	1	1	
financial records	1	1	1	1	1	
note pad	1	1	1	1	1	
other (please specify):						
other (please specify):						
other (please specify):						
	4	4			0.00%	0.00%
	Org. Orientation				Org. Integration	

Proficiency Value

2
3
2
1
3
1

Preference

Total: 0

Proficiency

Total: 0

POST:

Item	Work	Personal	Same	Separate	Paper	Automated
desktop calendar	1	1		1	1	
date/limer (scheduler)	1	1	1	1	1	
"to do" list	1	1	1	1	1	
post-it notes ("yellow stickies")	1	1	1	1	1	
financial records	1	1	1	1	1	
note pad	1	1	1	1	1	
other (please specify):						
other (please specify):						
other (please specify):						
	4	4			0.00%	0.00%
	Org. Orientation				Org. Integration	

Proficiency Value

2
3
2
1
3
1

Preference

Total: 0

Proficiency

Total: 0

6 How do you remind yourself of what you need to do during the day?

Pre	Item	Post
1	I don't keep reminders	1
	"to do" list on a paper-based planner	
	"to do" list on a desktop computer	
	"to do" list on an electronic organizer	
	"to do" list on a dry erase/chalk board	
	post-it notes ("yellow stickies")	
	string around finger or rubber band	
	pocket voice recorder or recording pen	
	other (please specify):	
	other (please specify):	

Preference Total	0	0
Proficiency Total	0	0

Performance Value
0
0
1
1
0
0
0
1

Proficiency Value
0
0
2
2
0
0
0
1

7 What are the three most often used things on your desk?

Pre	Item	Post
1	Calendar (paper)	
	Telephone	
	Desktop PC	

Post Proficiency Value
Calendar (paper)
Telephone
Desktop PC

Preference Value	
Pre	Post
0	0
1	1
1	1

(Automatically Computed)

8 How do you organize your work files?

Pre	Item	Post
1	by project	1
	by topic	
	by type	
	by date	
	other	

No Device Preference
or
Device Proficiency
from this Question

9 How often do you organize your work-related files?

Pre	Item	Post
1	once per day	1
	a couple times per week	
	once per week	
	a couple times a month	
	once a month	
	hardly ever	
	never	
	other (please specify):	

No Device Preference
or
Device Proficiency
from this Question

Organizational Rating
Pre 5
Post 5

10 How do you organize your personal files?

Pre	Item	Post
1	by project	1
	by topic	
	by type	
	by date	
	other	

No Device Preference
or
Device Proficiency
from this Question

11 How often do you organize your personal files?

Pre	Item	Post
	once per day	
	a couple times per week	
	once per week	
1	a couple times a month	1
	once a month	
	hardly ever	
	never	
	other (please specify):	

No Device Preference
or
Device Proficiency
from this Question

Organizational Rating
Pre 3
Post 3

Subject #3

12 How do you communicate with people in job-related activities? (Indicate all that apply in the "USE" column and then rank them in the "RANK" column with 1 being most important):

Pre	Post	Means of Communication	Use Rank	Post Rank
1	4	video teleconferencing	1	4
1	1	email	1	1
		pager/voicemail		
1	2	telephone (cellular)	1	2
		telephone (regular)		
1	3	radio (walkie-talkie)	1	3
		written notes		
		other (please specify):		

Preference Total	33
Proficiency Total	323

Proficiency Value	5
Preference Value	1
Pre Rank Adjusted	125
Post Rank Adjusted	3

13 Which of the following electronic devices do you currently use routinely in your job?

Pre	Post	Item	Post
1	1	laptop computer	1
1	1	desktop computer	1
		personal digital assistant (PDA)	
		cellular phone	
		pager	
1	1	fax machine	1
		camera (digital)	
		camera (film)	
		radio (walkie-talkie)	
		other (please specify):	

Preference Total	33
Proficiency Total	11

Proficiency Value	5
Preference Value	1

14 Which of the following electronic devices have you used in your job? (past or present):

Pre	Item	Post
1	laptop computer	1
1	desktop computer	1
	personal digital assistant (PDA)	
	cellular phone	
	pager	
1	fax machine	1
	camera (digital)	
	camera (film)	
	radio (walkie-talkie)	
	other (please specify):	
1	Preference Total	1
1	Proficiency Total	1

Preference Value
1
1
1
1
1
1
1
1
1
1

Proficiency Value
5
4
5
3
2
2
3
1
2

15 Which of the following electronic devices do you currently own?

Pre	Item	Post
1	laptop computer	1
1	desktop computer	1
	personal digital assistant (PDA)	
	cellular phone	
	pager	
1	fax machine	1
	camera (digital)	
1	camera (film)	1
	radio (walkie-talkie)	
	other (please specify):	
4	Preference Total	4
12	Proficiency Total	12

Preference Value
1
1
1
1
1
1
1
1
1
1

Proficiency Value
5
4
5
3
2
2
3
1
2

Subject #3

16 Which of the following electronic devices have you owned previously but do not any longer?

Pre	Item	Post	Preference Value	Proficiency Value
	laptop computer		1	5
	desktop computer		1	4
	personal digital assistant (PDA)		1	5
1	cellular phone	1	1	3
1	pager	1	1	2
	fax machine		1	2
	camera (digital)		1	3
	camera (film)		1	1
	radio (walkie-talkie)		1	2
	other (please specify):			
Preference Total		2		
Proficiency Total		3		

17 Why do you no longer use the devices you indicated above?

Pre	Post
Too large, bulky, heavy.	(SAME)
Too many functions.	
Expensive.	

Subject #3

18

As you conduct a meeting or present a brief in your job, what materials do you prefer to use for you notes?
(indicate all applicable in the "USE" column and then rank these in order of preference in the "RANK" column
1 being your first choice):

Pre	Post
Use Rank	Use Rank
1 3	1 3
note pad, notebook, loose pages	
scraps of paper (napkin, envelope)	
index cards	
1 2	1 2
date-timer or organizer (paper-based)	
1 1	1 1
computerized presentation software	
1 4	1 4
electronic organizer (PDA, etc.)	
other (please specify):	
other (please specify):	

2	2
525	525
Preference Total	Preference Total
Proficiency Total	Proficiency Total

Preference Value	Proficiency Value	Pre Rank Adjusted	Post Rank Adjusted
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
1	4	4	4
1	5	1.25	1.25
		0	0
		0	0

19

If an ideal device was available that could assist you in your job, what would it do?

Pre

How big or small is it?:
small

How do you enter data?:
handwriting

Functions?:
- calendar
- notes
- calculator
- address/contacts

How does it work with other devices?:
- doesn't need to.

Post

How big or small is it?:
SAME

How do you enter data?:
SAME

Functions?:
SAME

How does it work with other devices?:
SAME

Subject #3

- 20 Imagine that everybody in your organization has the device you just described. How would that change your approach to meetings and routine job tasks?

Pre	
promptness	
end meetings on time	
alert to important functions	
Post	
	SAME

- 21 Imagine the following scenarios:

- a. You are passing a work associate in the passageway. She asks if you knew about a meeting scheduled for later in the week. You were not aware of the meeting. What do you do next? How do you plan to recall the meeting time and location?

Pre	
Wheel through notes.	
Scramble to coordinate.	
Try to find a calendar.	
Post	
	SAME

Pre	
Preference Total	
Proficiency Total	
Post	

Subject #3

- b. While having lunch, you see someone you had known at a previous duty station. You ask for his phone number or address in order to stay in touch. What do you do next? How do you plan to record the phone number or address?

Pre	write it down on a piece of paper. transfer it to electronic organizer.	Post	SAME
Preference Total		Proficiency Total	

- c. While in a Department Head meeting your Commanding Officer asks you for information that you do not have with you. You know this information is on your desktop computer and is easily available from any networked computer. There are network connections throughout the meeting room. What do you do next? How do you plan to retrieve the desired information? Would you be comfortable with getting up from the table to access one of the network connections? Why?

Pre	Jump on computer. Log in remotely to access file. I would feel comfortable.	Post	SAME
Preference Total		Proficiency Total	

- d. You have just been called to a meeting that is to start in a half hour. No other information regarding the meeting is available. What do you do next? What information and in what form do you prepare to take with you?

Pre	Attend meeting.	Post
	Deal it then.	
	If they are so unprepared about meeting, how do they expect you to be?	
	SAME	

Pre Preference Total
Proficiency Total Post

22. Please indicate all of the following software applications you have used:

Pre	Software Application	Post	Proficiency Value
1	Word Processor	1	2
1	Spreadsheet	1	4
1	Database	1	5
1	Calendar/Day-Timer	1	2
1	Web Browser	1	3
1	Presentation	1	4
1	Email	1	2
1	Contact Management/Address Book	1	2
7		7	
22		22	

Pre Preference Total
Proficiency Total Post

23. Regarding my knowledge of computers, I consider myself to be:

Pre	Knowledgeable	Post	Proficiency Value
	Very Unknowledgeable		0
1	Somewhat Unknowledgeable	1	1
	Somewhat Knowledgeable		3
	Knowledgeable		4
	Very Knowledgeable		5
3		3	

Pre Preference Total
Proficiency Total Post

24 Regarding my proficiency with computers, I consider myself to be:

Pre	Proficiency	Post
	Very Non-Proficient	
	Somewhat Non-Proficient	
1	Somewhat Proficient	1
	Proficient	
	Very Proficient	
Pre	Proficiency Total	Post
3		3

Proficiency Value
0
1
3
4
5

25 Regarding my comfort with using computers, I consider myself to be:

Pre	Comfortable	Post
	Very Uncomfortable	
	Somewhat Uncomfortable	
	Somewhat Comfortable	
1	Comfortable	1
	Very Comfortable	
Pre	Preference Total	Post
1		1

Preference Value
0
1
3
4
5

Subject # 3 Survey Results

Total Device Preference	Pre	Post
	16	36
Total Device Proficiency	Pre	Post
	99.3	99.3

NPS-SOPCP Survey Responses for Subject # 4

- 1 When you get to your office, what is the first piece of information you check? (Please indicate only one):

Pre	Item	Post	Preference Value	Proficiency Value
	daily schedule	1	0	0
	"to do" list		0	0
	voicemail and phone messages		1	2
	plan of the day		0	0
1	email		1	2
	headline news from newspapers		0	0
	headline news from web sites		0	0
	headline news from another source		1	3
	other, please specify:		(Subjective)	(Subjective)

1	Preference Total	0
2	Proficiency Total	0

- 2 Please list and describe the three most important job-related tasks you do upon arriving at your office:

Pre	Prof	Post	Preference Value	Proficiency Value
	email	daily schedule		
	voicemail	email		
	to do list	voicemail		

(Subjective
Evaluation
of all responses)

2	Preference Total	2
5	Proficiency Total	5

- 3 What types of work-related information do you need immediate access to throughout the typical work day? (Indicate all that apply):

Pre	Use Rank	Item	Post	Use Rank	Preference Value	Proficiency Value	Pre Rank Adjusted	Post Rank Adjusted
1	4	daily schedule	1	1	0	0	0	0
1	3	"to do" list	1	2	0	0	0	0
1	5	address book	1	7	0	0	0	0
1	6	project documents	1	6	0	0	0	0
1	8	news headlines	1	8	0	0	0	0
1	2	financial reports	1	3	0	0	0	0
1	1	voicemail	1	1	1	2	1	0.8666667
1	7	email	1	4	1	2	2	0.5
1	7	world wide web browsing	1	5	1	3	0.4285714	0.6
		other (please specify):					0	0

3	Preference Total	3
3.43	Proficiency Total	1.77

- 4 What types of personal information do you need immediate access to throughout the typical work day? (Indicate all that apply):

Pre	Item	Post
Use Rank		Use Rank
1 4	daily schedule	1 1
1 5	"to do" list	1 2
	address book	
	project documents	
	news headlines	
	financial reports	
1 2	voicemail	1 4
1 1	email	1 3
1 3	world wide web browsing	1 5
	other (please specify):	

Preference Value	Proficiency Value	Pre Rank Adjusted	Post Rank Adjusted
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
1	2	1	0.5
1	2	2	0.666667
1	3	1	0.6
1	3	1	0

(Subjective)

Preference Total	Proficiency Total
3	3
4	177

- 5 Please select all of the following items that you utilize regularly. Indicate if you maintain a resources for work-related and/or personal information, if they are in the same or separate objects and please list whether they are paper-based or are automated through your computer (desktop, laptop or PDA - do not indicate type of computer):

PRE:

Item	Work	Personal	Same	Separate	Paper	Automated
desktop calendar	1	1	1	1	1	1
date/timer (scheduler)	1	1	1	1	1	1
"to do" list	1	1	1	1	1	1
post-it notes ("yellow stickies")	1	1	1	1	1	1
financial records	1	1	1	1	1	1
note pad	1	1	1	1	1	1
other (please specify):						
other (please specify):						
other (please specify):						
Org. Orientation	5	5			0.00%	0.00%

Proficiency Value

2
3
2
1
3
1

POST:

Item	Work	Personal	Same	Separate	Paper	Automated
desktop calendar	1	1	1	1	1	1
date/timer (scheduler)	1	1	1	1	1	1
"to do" list	1	1	1	1	1	1
post-it notes ("yellow stickies")	1	1	1	1	1	1
financial records	1	1	1	1	1	1
note pad	1	1	1	1	1	1
other (please specify):						
other (please specify):						
other (please specify):						
Org. Orientation	6	3			0.00%	0.00%

Proficiency Value

2
3
2
1
3
1

Preference Total: 3

Proficiency Total: 11

- 6 How do you remind yourself of what you need to do during the day?

Pre	Item	Post
	I don't keep reminders	
	"to do" list on a paper-based planner	
	"to do" list on a desktop computer	
	"to do" list on an electronic organizer	1
	"to do" list on a dry erase/chalk board	
1	post-it notes ("yellow stickies")	1
	string around finger or rubber band	
	pocket voice recorder or recording pen	
	other (please specify):	
	other (please specify):	

0	Preference Total	1
0	Proficiency Total	2

Performance Value	Proficiency Value
0	0
0	0
1	2
1	2
0	0
0	0
0	0
1	1

- 7 What are the three most often used things on your desk?

Pre	Proficiency Value
	Pen
	Desktop PC
	Post it notes

1	Preference Total	2
4	Proficiency Total	3

Post	Proficiency Value
	Desktop PC
	Pen
	PDA

Preference Value	Post
0	1
1	0
0	1

(Automatically Computed)

- 8 How do you organize your work files?

Pre	Item	Post
	by project	
1	by topic	1
	by type	
	by date	
	other	

No Device Preference
or
Device Proficiency
from this Question

Subject #4

9 How often do you organize your work-related files?

Pre	Item	Post
1	once per day	1
	a couple times per week	
	once per week	
	a couple times a month	
	once a month	
	hardly ever	
	never	
	other (please specify):	

No Device Preference
or
Device Proficiency
from this Question

Organizational Rating
Pre 5
Post 5

10 How do you organize your personal files?

Pre	Item	Post
1	by project	1
	by topic	
	by type	
	by date	
	other	

No Device Preference
or
Device Proficiency
from this Question

11 How often do you organize your personal files?

Pre	Item	Post
1	once per day	1
	a couple times per week	
	once per week	
	a couple times a month	
	once a month	
	hardly ever	
	never	
	other (please specify):	

No Device Preference
or
Device Proficiency
from this Question

Organizational Rating
Pre 5
Post 5

Subject #4

12 How do you communicate with people in job-related activities? (Indicate all that apply in the "USE" column and then rank them in the "RANK" column with 1 being most important):

Pre	Use	Rank	Means of Communication	Post	Use	Rank
			video teleconferencing			
1	1	1	email		1	1
1	2	2	pager/voicemail		1	3
1	5	5	telephone (cellular)		1	4
1	3	3	telephone (regular)		1	2
			radio (walkie-talkie)			
1	4	4	written notes		1	5
			other (please specify):			
4			Preference Total		4	
327			Proficiency Total		342	

Proficiency Value	Preference Value	Pre Rank Adjusted	Post Rank Adjusted
5	1	0	0
3	1	3	3
2	1	1	0.666667
3	1	0.5	0.75
2	1	0.666667	1
2	1	0	0
0	0	0	0

13 Which of the following electronic devices do you currently use routinely in your job?

Pre	Item	Post
	laptop computer	
1	desktop computer	1
	personal digital assistant (PDA)	1
	cellular phone	
1	pager	1
1	fax machine	1
	camera (digital)	
	camera (film)	
	radio (walkie-talkie)	
	other (please specify):	
3	Preference Total	4
8	Proficiency Total	13

Proficiency Value	Preference Value
5	1
4	1
5	1
3	1
2	1
2	1
2	1
3	1
1	1
2	1

Subject #4

14 Which of the following electronic devices have you used in your job? (past or present):

Pre	Item	Post
1	laptop computer	1
1	desktop computer	1
1	personal digital assistant (PDA)	1
1	cellular phone	1
1	pager	1
1	fax machine	1
1	camera (digital)	1
1	camera (film)	1
1	radio (walkie-talkie)	1
1	other (please specify):	

5	Preference Total	7
17	Proficiency Total	22

Preference Value
1
1
1
1
1
1
1
1
1
1
1

Proficiency Value
5
4
5
3
2
2
3
1
1
2

15 Which of the following electronic devices do you currently own?

Pre	Item	Post
1	laptop computer	1
1	desktop computer	1
1	personal digital assistant (PDA)	1
1	cellular phone	1
1	pager	1
1	fax machine	1
1	camera (digital)	1
1	camera (film)	1
1	radio (walkie-talkie)	1
1	other (please specify): Elec. Orgzr.	1

5	Preference Total	5
15	Proficiency Total	13

Preference Value
1
1
1
1
1
1
1
1
1
1
1

Proficiency Value
5
4
5
3
2
2
3
1
1
2

Subject #4

16 Which of the following electronic devices have you owned previously but do not any longer?

Pre	Item	Post	Preference Value	Proficiency Value
	laptop computer		1	5
	desktop computer		1	4
	personal digital assistant (PDA)		1	5
	cellular phone		1	3
	pager		1	2
	fax machine		1	2
	camera (digital)		1	3
	camera (film)		1	1
	radio (walkie-talkie)		1	2
1	other (please specify) Camcorder	1		
	Preference Total	11		
	Proficiency Total	33		

17 Why do you no longer use the devices you indicated above?

Pre	Post
Stolen	(SAME)

- 18 As you conduct a meeting or present a brief in your job, what materials do you prefer to use for you notes?
(indicate all applicable in the "USE" column and then rank these in order of preference in the "RANK" column
1 being your first choice):

Pre	Post	Media for Keeping Meeting Notes	Use	Rank
1	3	note pad, notebook, loose pages	1	2
		scraps of paper (napkin, envelope)		
		index cards		
		date-timer or organizer (paper-based)		
1	1	computerized presentation software	1	3
1	2	electronic organizer (PDA, etc.)	1	1
		other (please specify):		
		other (please specify):		

Preference Total	2
Proficiency Total	633

Preference Value	0
	0
	0
	0
	4
	5

Proficiency Value	0
	0
	0
	0
	4
	5

Pre Rank Adjusted	0
	0
	0
	0
	4
	2.5
	0
	0
	0

Post Rank Adjusted	0
	0
	0
	0
	5
	0
	0
	0

- 19 If an ideal device was available that could assist you in your job, what would it do?

Pre	Post
How big or small is it?:	pocket-size
How do you enter data?:	standard keyboard, handwriting
Functions?:	<ul style="list-style-type: none"> - email - voicemail - spreadsheet - graphs - printing - word processing - file transfer
How does it work with other devices?:	<ul style="list-style-type: none"> - dial-up (land line or cellular). - simple cable connection.

Pre	Post
How big or small is it?:	pocket-size
How do you enter data?:	standard keyboard, handwriting
Functions?:	<ul style="list-style-type: none"> - calendar - scheduler - task manager - note pad - word processing - file transfer (to other portable devices)
How does it work with other devices?:	<ul style="list-style-type: none"> - dial-up (land line or cellular). - simple cable connection. - Infrared link

- 20 Imagine that everybody in your organization has the device you just described. How would that change your approach to meetings and routine job tasks?

<p>Pre</p> <p>Information needed for meetings could be retrieved on the spot and shared with others without cumbersome papers to carry around.</p>	<p>Post</p> <p>Info can be disseminated paperlessly.</p> <p>Still need to be organized to work properly.</p>
---	---

- 21 Imagine the following scenarios:

- a. You are passing a work associate in the passageway. She asks if you knew about a meeting scheduled for later in the week. You were not aware of the meeting. What do you do next? How do you plan to recall the meeting time and location?

<p>Pre</p> <p>Write on piece of paper or ask her to email me with the meeting specs.</p> <p>If that doesn't work, write the items on a scrap piece of paper or my hand.</p>	<p>Post</p> <p>Ask her to email me the specs.</p> <p>If we had ideal (compatible) PDAs, she could IR info to me in the hallway.</p>
--	--

<p>Pre</p>	<p>Post</p>
-------------------	--------------------

Preference Total
Proficiency Total

Subject #4

- b. While having lunch, you see someone you had known at a previous duty station. You ask for his phone number or address in order to stay in touch. What do you do next? How do you plan to record the phone number or address?

Pre	Write on scrap paper or hand.	Post
		Enter data in organizer (PDA) on the spot.
Pre	Preference Total Proficiency Total	Post

- c. While in a Department Head meeting your Commanding Officer asks you for information that you do not have with you. You know this information is on your desktop computer and is easily available from any networked computer. There are network connections throughout the meeting room. What do you do next? How do you plan to retrieve the desired information? Would you be comfortable with getting up from the table to access one of the network connections? Why?

Pre	Inform CO that I have the info on my machine and that I can access the info as soon as I return to my desk (if no computers in room). If computers in room, access it immediately.	Post
		SAME
Pre	Preference Total Proficiency Total	Post

Subject #4

- d. You have just been called to a meeting that is to start in a half hour. No other information regarding the meeting is available. What do you do next? What information and in what form do you prepare to take with you?

Pre	Post
Take note pad and pen.	Take pen, pad and PDA.
Call around to find out meeting topic.	Call around to find out meeting topics.
Pre	Post
Preference Total	Preference Total
Proficiency Total	Proficiency Total

- 22 Please indicate all of the following software applications you have used:

Pre	Software Application	Post	Preference Value	Proficiency Value
1	Word Processor	1	1	2
1	Spreadsheet	1	1	4
1	Database	1	1	5
1	Calendar/Day-Timer	1	1	2
1	Web Browser	1	1	3
1	Presentation	1	1	4
1	Email	1	1	2
1	Contact Management/Address Book	1	1	2
Pre	Preference Total	Post		
7	22	7		
	Proficiency Total			

- 23 Regarding my knowledge of computers, I consider myself to be:

Pre	Knowledgeable	Post	Preference Value
	Very Unknowledgeable		0
	Somewhat Unknowledgeable		1
	Somewhat Knowledgeable		3
1	Knowledgeable	1	4
	Very Knowledgeable		5
Pre	Preference Total	Post	
4		4	
	Proficiency Total		

24 Regarding my proficiency with computers, I consider myself to be:

Pre	Proficiency	Post
	Very Non-Proficient	
	Somewhat Non-Proficient	
	Somewhat Proficient	
	Proficient	
1	Very Proficient	1
Pre	Proficiency Total	Post
5		5

Proficiency Value
0
1
3
4
5

25 Regarding my comfort with using computers, I consider myself to be:

Pre	Comfortable	Post
	Very Uncomfortable	
	Somewhat Uncomfortable	
	Somewhat Comfortable	
	Comfortable	
1	Very Comfortable	1
Pre	Preference Total	Post
5		5

Preference Value
0
1
3
4
5

Subject # 4 Survey Results

Total Device Preference

Pre	Post
14	53
120	113

NPS-SOPCP Survey Responses for Subject # 5

1 When you get to your office, what is the first piece of information you check? (Please indicate only one):

Pre		Item	Post	Preference Value	Proficiency Value
		daily schedule		0	0
		"to do" list		0	0
		voicemail and phone messages		1	2
		plan of the day		0	0
1		email	1	1	2
		headline news from newspapers		0	0
		headline news from web sites		0	0
		headline news from another source		1	3
		other, please specify:			

1	2	Preference Total	1	2
1	2	Proficiency Total	1	2

2 Please list and describe the three most important job-related tasks you do upon arriving at your office:

Prof	Prof	Pre	Prof	Prof	Post
		prioritize tasks			prioritize tasks
		email			email
		organize information			organize information

Pre	Post
1	1
3	3

3 What types of work-related information do you need immediate access to throughout the typical work day? (Indicate all that apply):

Pre					Post		Preference Value	Proficiency Value	Pre Rank Adjusted	Post Rank Adjusted
Use	Rank	Item	Use	Rank						
1	2	daily schedule	1	1	0	0	0	0		
1	1	"to do" list	1	3	0	0	0	0		
1	1	address book			0	0	0	0		
1	4	project documents	1	5	0	0	0	0		
		news headlines			0	0	0	0		
1	5	financial reports	1	4	0	0	0	0		
		voicemail			1	2	0	0		
1	3	email			1	2	0.6666667	1		
		world wide web browsing	1	2	1	3	0	0		
		other (please specify)					0	0		

1	Preference Total	1
0.67	Proficiency Total	1

Subject #5

4 What types of personal information do you need immediate access to throughout the typical work day? (Indicate all that apply):

Pre Use Rank	Item	Post Use Rank
1	2	1
1	1	1
1	1	3
1	4	1
	project documents	4
	news headlines	
	financial reports	
	voicemail	
1	3	1
	email	2
	world wide web browsing	
	other (please specify):	

Preference Value
0
0
0
0
0
0
0
1
1
1
(Subjective)

Proficiency Value
0
0
0
0
0
0
0
2
2
3

Pre Rank Adjusted
0
0
0
0
0
0
0
0
0
0
0

Post Rank Adjusted
0
0
0
0
0
0
0
0
0
0
0

Preference Total	11
Proficiency Total	357

5 Please select all of the following items that you utilize regularly. Indicate if you maintain a resources for work-related and/or personal information, if they are in the same or separate objects and please list whether they are paper-based or are automated through your computer (desktop, laptop or PDA - do not indicate type of computer):

Item	Work	Personal	Same	Separate	Paper	Automated
desktop calendar	1	1	1	1	1	1
date/timer (scheduler)	1	1	1	1	1	1
"to do" list	1	1	1	1	1	1
post-it notes ("yellow stickies")	1	1	1	1	1	1
financial records	1	1	1	1	1	1
note pad	1	1	1	1	1	1
other (please specify):						
other (please specify):						
other (please specify):						
	5	5			70.00%	0.00%
	Org. Orientation				Org. Integration	

Proficiency Value
2
3
2
1
3
1

Preference Total:	11
Proficiency Total:	3

Item	Work	Personal	Same	Separate	Paper	Automated
desktop calendar	1	1	1	1	1	1
date/timer (scheduler)	1	1	1	1	1	1
"to do" list	1	1	1	1	1	1
post-it notes ("yellow stickies")	1	1	1	1	1	1
financial records	1	1	1	1	1	1
note pad	1	1	1	1	1	1
other (please specify):						
other (please specify):						
other (please specify):						
	5	5			40.00%	0.00%
	Org. Orientation				Org. Integration	

Proficiency Value
2
3
2
1
3
1

Preference Total:	11
Proficiency Total:	3

6 How do you remind yourself of what you need to do during the day?

Pre	Item	Post
1	I don't keep reminders	
	"to do" list on a paper-based planner	1
	"to do" list on a desktop computer	
	"to do" list on an electronic organizer	
	"to do" list on a dry erase/chalk board	
1	post-it notes ("yellow stickies")	1
	string around finger or rubber band	
	pocket voice recorder or recording pen	
	other (please specify):	
	other (please specify):	

0	Preference Total	0
0	Proficiency Total	0

Performance Value
0
0
1
1
0
0
0
1

Proficiency Value
0
0
2
2
0
0
0
1

7 What are the three most often used things on your desk?

Pre	Proficiency Value
	Pen
	Desktop PC
	Telephone

0	Preference Total	0
0	Proficiency Total	0

Post	Proficiency Value
	Desktop PC
	Pen
	Telephone

Preference Value	
Pre	Post
0	1
1	0
1	1

(Automatically Computed)

8 How do you organize your work files?

Pre	Item	Post
1	by project	
	by topic	1
	by type	
	by date	
	other	

No Device Preference
or
Device Proficiency
from this Question

Subject #5

9 How often do you organize your work-related files?

Pre	Item	Post
	once per day	
	a couple times per week	1
1	once per week	
	a couple times a month	
	once a month	
	hardly ever	
	never	
	other (please specify):	

No Device Preference
or
Device Proficiency
from this Question

Organizational Rating
Pre 4
Post 5

10 How do you organize your personal files?

Pre	Item	Post
	by project	
1	by topic	1
	by type	
	by date	
	other	

No Device Preference
or
Device Proficiency
from this Question

11 How often do you organize your personal files?

Pre	Item	Post
	once per day	
	a couple times per week	
	once per week	
1	a couple times a month	1
	once a month	
	hardly ever	
	never	
	other (please specify):	

No Device Preference
or
Device Proficiency
from this Question

Organizational Rating
Pre 3
Post 3

- 12 How do you communicate with people in job-related activities? (Indicate all that apply in the "USE" column and then rank them in the "RANK" column with 1 being most important):

Pre	Rank	Means of Communication	Post
Use	Rank	Use	Rank
1	1	video teleconferencing	1
		pager/voicemail	1
1	2	telephone (cellular)	1
		telephone (regular)	2
		radio (walkie-talkie)	
1	3	written notes	1
		other (please specify):	3

Preference Total 2
Proficiency Total 4.5

Preference Value	Proficiency Value	Pre Rank Adjusted	Post Rank Adjusted
1	5	0	0
1	3	3	3
1	2	0	0
1	3	1.5	1.5
1	2	0	0
1	2	0	0
0	0	0	0

- 13 Which of the following electronic devices do you currently use routinely in your job?

Pre	Item	Post
Use	Use	Use
1	laptop computer	1
	desktop computer	1
	personal digital assistant (PDA)	
	cellular phone	
	pager	
1	fax machine	1
	camera (digital)	1
	camera (film)	1
	radio (walkie-talkie)	
	other (please specify):	

Preference Total 3
Proficiency Total 15

Preference Value	Proficiency Value
1	5
1	4
1	5
1	3
1	2
1	2
1	3
1	1
1	2

14 Which of the following electronic devices have you used in your job? (past or present):

Pre	Item	Post
1	laptop computer	1
1	desktop computer	1
	personal digital assistant (PDA)	
	cellular phone	1
	pager	
1	fax machine	1
1	camera (digital)	1
1	camera (film)	1
	radio (walkie-talkie)	1
	other (please specify):	

Preference Value
1
1
1
1
1
1
1
1
1
1

Proficiency Value
5
4
5
3
2
2
3
1
1
2

5	Preference Total	7
15	Proficiency Total	20

15 Which of the following electronic devices do you currently own?

Pre	Item	Post
1	laptop computer	1
	desktop computer	
	personal digital assistant (PDA)	
1	cellular phone	1
	pager	
1	fax machine	1
	camera (digital)	
1	camera (film)	1
	radio (walkie-talkie)	
	other (please specify):	

Preference Value
1
1
1
1
1
1
1
1
1
1

Proficiency Value
5
4
5
3
2
2
3
1
1
2

5	Preference Total	4
11	Proficiency Total	13

Subject #5

16 Which of the following electronic devices have you owned previously but do not any longer?

Pre	Item	Post	Preference Value	Proficiency Value
	laptop computer		1	5
1	desktop computer	1	1	4
	personal digital assistant (PDA)		1	5
	cellular phone		1	3
	pager		1	2
	fax machine		1	2
	camera (digital)		1	3
	camera (film)		1	1
	radio (walkie-talkie)		1	2
	other (please specify)			
	Preference Total	1		
	Proficiency Total	1		

17 Why do you no longer use the devices you indicated above?

Pre	Post
Laptop is more versatile and powerful enough to provide same functions as desktop.	(SAME)
Desktop computer was redundant.	Cannot afford new desktop computer at this time.

- 18 As you conduct a meeting or present a brief in your job, what materials do you prefer to use for your notes?
(indicate all applicable in the "USE" column and then rank these in order of preference in the "RANK" column
1 being your first choice):

Pre	Post
Use Rank	Use Rank
1 2	1 3
note pad, notebook, loose pages	
scraps of paper (napkin, envelope)	
index cards	
1 1 date-timer or organizer (paper-based)	1 1
1 3 computerized presentation software	1 2
electronic organizer (PDA, etc.)	
other (please specify):	
other (please specify):	

11	11
133	133

Preference Total
Proficiency Total

Preference Value	Proficiency Value	Pre Rank Adjusted	Post Rank Adjusted
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
1	4	1.11111111	2
1	5	0	0
		0	0
		0	0

- 19 If an ideal device was available that could assist you in your job, what would it do?

Pre	Post
How big or small is it?: palm-size	
How do you enter data?: voice, light pen, keyboard	
Functions?: - word processor - spreadsheet - database - calendar - scheduling - email access - address book - IR port - built-in cellular modem	
How does it work with other devices?:	

Post	Pre
How big or small is it?: SAME	
How do you enter data?: SAME	
Functions?: - note taking capability	
How does it work with other devices?:	

- 20 Imagine that everybody in your organization has the device you just described. How would that change your approach to meetings and routine job tasks?

Pre
<p>Improve routine correspondence.</p> <p>Improve scheduling of meetings.</p> <p>Improve transfer of information.</p>
Post

Post
SAME

- 21 Imagine the following scenario:

- a. You are passing a work associate in the passageway. She asks if you knew about a meeting scheduled for later in the week. You were not aware of the meeting. What do you do next? How do you plan to recall the meeting time and location?

Pre
<p>Write note in wheel book.</p> <p>Transfer to calendar when back in office.</p>
Post

Post
SAME

Pre	Preference Total
	Proficiency Total

Subject #5

- b. While having lunch, you see someone you had known at a previous duty station. You ask for his phone number or address in order to stay in touch. What do you do next? How do you plan to record the phone number or address?

Pre	Write note in wheel book. Transfer to address book when back in office.	Post
	Preference Total Proficiency Total	

Post	Write on napkin. Transfer to address book when back in office. - no longer carry wheel book everywhere.
------	---

- c. While in a Department Head meeting your Commanding Officer asks you for information that you do not have with you. You know this information is on your desktop computer and is easily available from any networked computer. There are network connections throughout the meeting room. What do you do next? How do you plan to retrieve the desired information? Would you be comfortable with getting up from the table to access one of the network connections? Why?

Pre	If needed immediately, request chance to use one network connections to retrieve info. If not needed immediately, would give brief outline of what I know and forward more detailed info later.	Post
	Preference Total Proficiency Total	

Post	SAME
------	------

- d. You have just been called to a meeting that is to start in a half hour. No other information regarding the meeting is available. What do you do next? What information and in what form do you prepare to take with you?

Pre	Notebook with brief sheets and summary data on most pressing topics. If not in brief sheets, brief to best knowledge and provide more detailed info later.	Post
	SAME	

Pre Preference Total
Proficiency Total

- 22 Please indicate all of the following software applications you have used:

Pre	Software Application	Post
1	Word Processor	1
1	Spreadsheet	1
1	Database	1
1	Calendar/Day-Timer	1
1	Web Browser	1
1	Presentation	1
1	Email	1
1	Contact Management/Address Book	1

Pre Preference Total
Proficiency Total

Preference Value	Proficiency Value
1	2
1	4
1	5
1	2
1	3
1	4
1	2
1	2

- 23 Regarding my knowledge of computers, I consider myself to be:

Pre	Knowledgeable	Post
	Very Unknowledgeable	
	Somewhat Unknowledgeable	
	Somewhat Knowledgeable	
1	Knowledgeable	1
	Very Knowledgeable	

Pre Proficiency Total
Post

Proficiency Value
0
1
3
4
5

24 Regarding my proficiency with computers, I consider myself to be:

Pre	Proficiency	Post
	Very Non-Proficient	
	Somewhat Non-Proficient	
	Somewhat Proficient	
1	Proficient	1
	Very Proficient	
Pre	Proficiency Total	Post
4		4

Proficiency Value
0
1
3
4
5

25 Regarding my comfort with using computers, I consider myself to be:

Pre	Comfortable	Post
	Very Uncomfortable	
	Somewhat Uncomfortable	
	Somewhat Comfortable	
1	Comfortable	1
	Very Comfortable	
Pre	Preference Total	Post
4		4

Preference Value
0
1
3
4
5

Subject # 5 Survey Results

Total Device Preference	Pre	Post
	35	40
Total Device Proficiency	Pre	Post
	93.2	109

PART II: NPS-SOPCP PALMTOP TECHNOLOGY SURVEY ANALYSIS

NPS-SOPCP Palmtop Technology Survey

Sample Survey Summary

Question #

1 Satisfaction with PDA/PC interface:

Week 2		Week 4
3	YES, I am satisfied	2
0	NO, I am not satisfied	0
2	I do not need to interface my PDA with my PC	3

Notes in red text boxes describe the information sought and the pertinence of the question.

Notes in blue text boxes are explanations of spreadsheet functions

Aggregate Satisfaction Ratings of all 5 participants are added together to compute a total Satisfaction Rating for each question.

Satisfaction Rating
3 2

For the palmtop to be truly useful, it must be able to synchronize information with a host PC. This question provides information regarding the effectiveness of the palmtop-PC connection.

2 The size of the PDA (please indicate one):

Week 2		Week 4
0	encouraged me to carry it with me and use it	0
3	discouraged me from carrying it with me and using it	4
2	had no influence in my use of it	1

Satisfaction Rating
-3 -4

Responses of all 5 participants are summed to yield the aggregate of each Week 2 and Week 4 response to each question.

3 The manner in which data is entered into the PDA (please indicate one):

Week 2		Week 4
0	encouraged me to carry it with me and use it	0
4	discouraged me from carrying it with me and using it	4
1	had no influence in my use of it	1

Satisfaction Rating
-4 -4

Week 2 and Week 4 Satisfaction Ratings computed by multiplying each response total by the corresponding Rating Factor at the bottom of this sheet in the red box.

4 The PDA is:

Week 2		Week 4
0	convenient to use	0
5	inconvenient to use	5

Satisfaction Rating
-5 -5

Responses to this question and the previous two provide valuable information regarding usability of the palmtop and the effectiveness of its ergonomic design.

5 I believe all Naval officers could benefit from using a PDA in their jobs.

Week 2		Week 4
4	TRUE	3
1	FALSE	2

Satisfaction Rating
3 1

This question determines whether or not these participants believe the palmtop is a useful tool for other officers like themselves.

6 I am considering procuring (either buying it yourself or allocating OPTAR funds) a PDA for use in my job.

Week 2		Week 4
0	TRUE	0
5	FALSE	5

Satisfaction Rating
-5 -5

This question determines whether or not these participants believe the palmtop is a worthwhile investment of government funds.

7 I am considering buying a PDA for my personal use.

Week 2		Week 4
2	TRUE	1
3	FALSE	4

Satisfaction Rating
-1 -3

Responses to this question are important because initially, officers wishing to use palmtops in their jobs will have to buy them themselves.

8 I prefer the PDA to my previous methods of information storage and retrieval.

Week 2		Week 4
1	TRUE	1
4	FALSE	4

Satisfaction Rating
-3 -3

This question allows participants to compare the ways in which they have always managed information and how they did so using the palmtop.

- 9 I believe the PDA has increased my productivity.

Week 2		Week 4
1	TRUE	1
4	FALSE	4

Satisfaction Rating	
-3	-3

Please explain why:

Aggregate list of responses by all 5 participants.

This question is EXTREMELY important in that it is the reason why people use palmtop computers. It answers the question of whether they are a helpful aid to Naval officers.

- 10 Please indicate all of the following functions you have utilized regularly on the PDA:

Week 2		Week 4
2	Word Processor (Microsoft Pocket Word)	1
1	Spreadsheet (Microsoft Pocket Excel)	0
0	Database (Please specify:)	0
5	Calendar/Day-Timer (Calendar - Microsoft Pocket Outlook)	4
0	Web Browser (Microsoft Pocket Internet Explorer)	1
0	Presentations (Microsoft Pocket PowerPoint)	0
2	Email (In-Box - Microsoft Pocket Outlook)	1
3	Contact Management/Address Book (Microsoft Pocket Outlook)	2
2	Handwriting Recognition (Calligrapher)	1
0	Other (please specify:)	1

This is a summation of all participants' responses to this question. It displays how many participants used the different functions of the palmtop regularly. This information determines which functions are most appealing and useful to these users.

- 11 Which of the following statements is more appropriate?

Week 2		Week 4
1	The PDA simplifies my routine job tasks	1
3	The PDA complicates my routine job tasks	3
1	I have no strong opinion	1

Satisfaction Rating	
-2	-2

Please explain why:

Aggregate list of responses by all 5 participants.

Palmtops will be used if they simply and speed up tasks. Otherwise, they will be discarded and the users will not recommend their use to others. This question determines whether the palmtop has been adequately designed to meet the requirements of these Naval officers.

- 12 Which of the following statements is more appropriate?

Week 2		Week 4
1	The PDA saves me a lot of time and effort in my job-related tasks	1
4	The PDA increased the amount of time and effort necessary to accomplish my job-related tasks	4

Satisfaction Rating	
-3	-3

Please explain why:

Aggregate list of responses by all 5 participants.

Although similar to Question #11, this question focuses on time savings, whereas the previous question regards a savings of physical and mental effort.

- 13 I found myself creating tasks to use my PDA for although I previously did not think I needed them while mobile.

Week 2		Week 4
0	TRUE	0
5	FALSE	5

Satisfaction Rating	
-5	-5

This question is meant to provide information regarding the usability of the palmtop. If it is readily usable, then most likely, users will attempt to adapt it to their needs or may attempt to adapt their needs to the functionality of the palmtop.

- 14 Please list and explain any additional tasks you would have liked to have been able to automate on your FDA:

Aggregate list of responses by all 5 participants.

With this question, participants are given the opportunity to phrase their needs in their own words. Individual comments are compiled and presented in one location for easier data interpretation.

- 15 Please list and explain any complaints you have regarding your PDA:

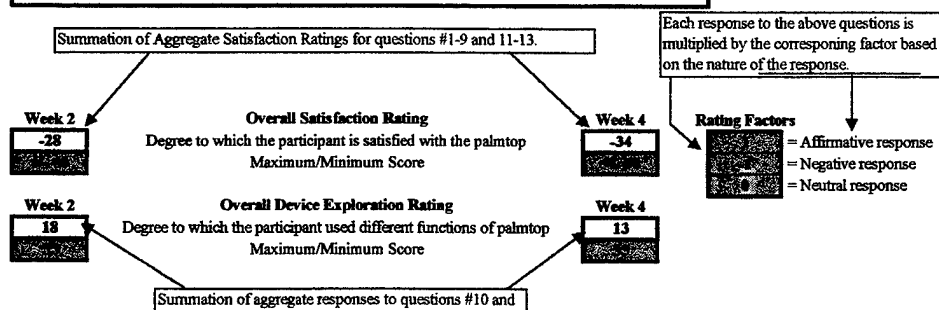
Aggregate list of responses by all 5 participants.

Subjects are able to comment on shortcomings they have noted with this palmtop. These shortcomings are then analyzed to determine their nature (ergonomic design, hardware limitation, or software limitation).

- 16 Please use the remaining space and the back of this page for additional comments:

Aggregate list of responses by all 5 participants.

Participants may make further comments on the palmtop, the technology or the NPS-SOPCP.



NPS-SOPCP Palmtop Technology Survey

Survey Summary

Comments in red text boxes describe trends noted in survey responses. These comments are a summarization of specific, individual data from each participant's responses on the following sheets.

Subject's written comments are represented by blue text.

Question #

1 Satisfaction with PDA/PC interface:

Week 2		Week 4
3	YES, I am satisfied	2
0	NO, I am not satisfied	0
2	I do not need to interface my PDA with my PC	3

Satisfaction Rating
3 2

Participants who attempted to connect the palmtop to their desktop PC were all satisfied with this process, although one participant stopped synchronizing the two during the study due to incompatible scheduling software applications.

2 The size of the PDA (please indicate one):

Week 2		Week 4
0	encouraged me to carry it with me and use it	0
3	discouraged me from carrying it with me and using it	4
2	had no influence in my use of it	1

Satisfaction Rating
-3 -4

Participants were generally dissatisfied with the size of the HP 360LX. Initially, 2 participants were indifferent to its size. Following the survey, only one was indifferent while the size discouraged the remaining 4 from using it.

3 The manner in which data is entered into the PDA (please indicate one):

Week 2		Week 4
0	encouraged me to carry it with me and use it	0
4	discouraged me from carrying it with me and using it	4
1	had no influence in my use of it	1

Satisfaction Rating
-4 -4

Participants were generally discouraged from using the HP 360LX because its methods of data entry. 80% of participants disliked the available methods of entering data while one was indifferent.

4 PDA is:

Week 2		Week 4
0	convenient to use	0
5	inconvenient to use	5

Satisfaction Rating
-5 -5

ALL participants found the device inconvenient to use.

5 I believe all Naval officers could benefit from using a PDA in their jobs.

Week 2		Week 4
4	TRUE	3
1	FALSE	2

Satisfaction Rating
3 1

Initially, 4 out of 5 subjects believed the palmtop would be a beneficial tool to assist Naval officers in their jobs. Following the study, only 3 participants had this belief.

6 I am considering procuring (either buying it yourself or allocating OPTAR funds) a PDA for use in my job.

Week 2		Week 4
0	TRUE	0
5	FALSE	5

Satisfaction Rating
-5 -5

No participants would be willing to use government funds to purchase a palmtop computer for use in their jobs.

7 I am considering buying a PDA for my personal use.

Week 2		Week 4
2	TRUE	1
3	FALSE	4

Satisfaction Rating
-1 -3

Initially, 2 of the 5 subjects considered buying a palmtop for their personal use. Following the study, only 1 participant considered it.

8 I prefer the PDA to my previous methods of information storage and retrieval.

Week 2		Week 4
1	TRUE	1
4	FALSE	4

Satisfaction Rating
-3 -3

All but one of the participants preferred their previous methods of managing information rather than using the palmtop.

- 9 I believe the PDA has increased my productivity.

Week 2		Week 4
1	TRUE	1
4	FALSE	4

Satisfaction Rating	
-3	-3

Please explain why:

Had incompatible software on desktop, had to enter schedule and tasking items twice.
Main method of communication is face-to-face. Taking notes on a computer seems impersonal and not appropriate.

Subject #1 was the only one to specify why she did not find the palmtop helpful in improving her productivity. Her reasons are both software and ergonomically-based.

- 10 Please indicate all of the following functions you have utilized regularly on the PDA:

Week 2		Week 4
2	Word Processor (Microsoft Pocket Word)	1
1	Spreadsheet (Microsoft Pocket Excel)	0
0	Database (Please specify:)	0
5	Calendar/Day-Timer (Calendar - Microsoft Pocket Outlook)	4
0	Web Browser (Microsoft Pocket Internet Explorer)	1
0	Presentations (Microsoft Pocket PowerPoint)	0
2	Email (In-Box - Microsoft Pocket Outlook)	1
3	Contact Management/Address Book (Microsoft Pocket Outlook)	2
2	Handwriting Recognition (Calligrapher)	1
0	Other (please specify: Really didn't use it much)	1

The calendar and address book functions were most often used by the participants. Initially, all used the calendar. At the end of the study, four continued to use it. In general, use of functions decreased as the study progressed.

- 11 Which of the following statements is more appropriate?

Week 2		Week 4
1	The PDA simplifies my routine job tasks	1
3	The PDA complicates my routine job tasks	3
1	I have no strong opinion	1

Satisfaction Rating	
-2	-2

Please explain why:

I receive/send a large volume of email daily. I typically receive only during regular business hours and rarely have to access it at home.
I ended up not using it the last 10-14 days of the study - I was too busy!

The PDA does work out great for meetings, but its layout is cumbersome.

It still has some limitations. It is slow on handwriting recognition and is not set up for a notetaking function. Machine needs to be improved to be useful.

Most participants found the palmtop to be complicating their routines. The reasons they give are ergonomic, software and hardware-oriented. Subject #4 is the only participant to make a positive comment, but Subject #5 seems to speak for all participants, "Machine needs to be improved to be useful."

- 12 Which of the following statements is more appropriate?

Week 2		Week 4
1	The PDA saves me a lot of time and effort in my job-related tasks	1
4	The PDA increased the amount of time and effort necessary to accomplish my job-related tasks	4

Satisfaction Rating	
-3	-3

Please explain why:

I had to spend time trying to learn/figure things out - time I don't have.
I did not like the handwriting recognition program - it didn't like my handwriting and I ended up having to correct all the time. So, I gave that function up after the second day.

It saves me the hassle of retyping notes for distribution.

Found myself having to re-write or type many words/phrases because the handwriting recognition software is slow and quirky.

The handwriting recognition software was noted to be a major complaint by all users. It was so ineffective that most participants stopped using it and a couple attributed their decreased willingness to use the palmtop on the available methods of data entry.

- 13 I found myself creating tasks to use my PDA for although I previously did not think I needed them while mobile.

Week 2		Week 4
0	TRUE	0
5	FALSE	5

Satisfaction Rating	
-5	-5

No participants stated that they had attempted to automate additional tasks on the palmtop so they could accomplish them while mobile.

- 14 Please list and explain any additional tasks you would have liked to have been able to automate on your PDA:

GPS receiver
TV reception
AM/FM receiver
Printer
Scanner
Digital camera
Voice memo recorder
Flashlight
Space for keys, cash, ID, checkbook

Too many functions with limited capabilities

This PDA has more than enough tasks.

Note-taking function that bulletizes and paginates. Voice recognition would be a good addition.

Along with the many hardware peripherals noted by Subject #2, every participant stated that they needed a note-taking capability more than the word processing function. During the Mid-Project Review meeting following Week 2, Subject #3 said it most appropriately, "I need a note taking device, not a word processing device."

- 15 Please list and explain any complaints you have regarding your PDA:

Size: It was not easy to carry it around. Can't put it in a uniform pocket. I was worried I'd drop it! So, it was inconvenient like an extra burden to carry around.

Keyboard: not bad for a small machine.

Screen: Quite readable.

Handwriting recognition software - (see # 12)

Still too bulky

Needs voice input/output

Output from name/addrss/telephone database is not useful
- needs database reporting flexibility

Needs a good monthly calendar printout.

Needs boyonet locking lug.

I need a reminder unit. Not a desktop trapped in a microorganism!

The PDA is great but it has more of a "baby laptop" feel to it. The size is fine, but the program layout and data entry method can make most computer non-users uncomfortable. For someone to be comfortable using this, vice pen and paper, it needs more of a familiar pen and paper feel (i.e., USR's palmtop - PalmPilot)

It was cumbersome to carry in uniform.

Although Subject #2's comment regarding a bayonette fitting is made in jest, it emphasizes the point that this device needs a great many improvements to be useful for Naval officers. Every participant noted the size being too large to fit in uniform pockets. The device was described as a burden and cumbersome by several subjects.

Subject #4, an avid computer user, makes a profound statement that best explains his more favorable opinion of the palmtop, "The size is fine, but the program layout and data entry method can make most computer non-users uncomfortable...it needs more of a familiar pen and paper feel."

- 16 Please use the remaining space and the back of this page for additional comments:

Fascinated with the technology! Love the idea of it - can see real potential. But just didn't end up being the kind of tool I need in this job. I ended up not using it the last 10-14 days of the study. I was too busy!

I have tried to use this PDA for almost every option available on it. I am not too fond of the email and the fax doesn't really substantiate its existence. To be honest, the scheduler and word processor (for note taking) are the only things that I found really useful!!

Subject #1 made several informative insights during the study. She pointed out the importance of job position in the use of a handheld computer. As an Executive Officer, she had less need for many of the capabilities the palmtop provided. However, she notes that in previous jobs, they could have been very helpful.

The Overall Satisfaction Rating verifies the many complaints and negative comments made by project participants throughout the study. The more they used the device, the less satisfied they became as is indicated by the more negative result for Week 4 compared to Week 2. Although participants did not fully utilize all the functions of the palmtop, as the Overall Device Exploration Rating reveals, they cited numerous ergonomic design faults as their reason for being less willing to use the device.



Overall Satisfaction Rating
Degree to which the participant is satisfied with the palmtop
Maximum/Minimum Score



Rating Factors
= Affirmative response
= Negative response
= Neutral response



Overall Device Exploration Rating
Degree to which the participant used different functions of palmtop
Maximum/Minimum Score



NPS-SOPCP Palmtop Technology Survey

Subject # X

The subject's responses are recorded in the Week 2 column the first time this survey is administered then in the Week 4 column the second time. Each response is entered as a one (1) to allow for simple spreadsheet calculations.

Question #

The Subject Number as defined by Table 4.1

1 Are you satisfied with the interface between your PC and your PDA?

Week 2	Week 4	Satisfaction Rating
YES, I am satisfied		0 0
NO, I am not satisfied		
I do not need to interface my PDA with my PC		

Week 2 and Week 4 Satisfaction Ratings computed by multiplying each response by the corresponding Rating Factor at the bottom of this sheet in the red box.

2 The size of the PDA (please indicate one):

Week 2	Week 4	Satisfaction Rating
encouraged me to carry it with me and use it		0 0
discouraged me from carrying it with me and using it		
had no influence in my use of it		

Note: The order of responses to Questions #2 and 3 was changed from the original survey to allow for a simpler spreadsheet calculation.

3 The manner in which data is entered into the PDA (please indicate one):

Week 2	Week 4	Satisfaction Rating
encouraged me to carry it with me and use it		0 0
discouraged me from carrying it with me and using it		
had no influence in my use of it		

4 Overall, the PDA is (please indicate one):

Week 2	Week 4	Satisfaction Rating
convenient to use		0 0
inconvenient to use		

5 I believe all Naval officers could benefit from using a PDA in their jobs.

Week 2	Week 4	Satisfaction Rating
TRUE		0 0
FALSE		

6 I am considering procuring (either buying it yourself or allocating OPTAR funds) a PDA for use in my job.

Week 2	Week 4	Satisfaction Rating
TRUE		0 0
FALSE		

7 I am considering buying a PDA for my personal use.

Week 2	Week 4	Satisfaction Rating
TRUE		0 0
FALSE		

8 I prefer the PDA to my previous methods of information storage and retrieval.

Week 2	Week 4	Satisfaction Rating
TRUE		0 0
FALSE		

- 9 I believe the PDA has increased my productivity.

Week 2		Week 4
	TRUE	
	FALSE	

Satisfaction Rating	
0	0

Please explain why:

Written responses in this area are compiled and summarized in the Survey Summary.

- 10 Please indicate all of the following functions you have utilized regularly on the PDA:

Week 2		Week 4
	Word Processor (Microsoft Pocket Word)	
	Spreadsheet (Microsoft Pocket Excel)	
	Database (Please specify: _____)	
	Calendar/Day-Timer (Calendar - Microsoft Pocket Outlook)	
	Web Browser (Microsoft Pocket Internet Explorer)	
	Presentations (Microsoft Pocket PowerPoint)	
	Email (In-Box - Microsoft Pocket Outlook)	
	Contact Management/Address Book (Microsoft Pocket Outlook)	
	Handwriting Recognition (Calligrapher)	
	Other (please specify: _____)	

The sum of all responses to this question is added to Question #1's Satisfaction Rating and Question #14's responses to compute the Overall Device Exploration Rating found at the bottom of the page.

Note: Since the Palmtop-PC connection is a technical factor, it has been deemed worthy of inclusion in Overall Device Rating.

- 11 Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA simplifies my routine job tasks	
	The PDA complicates my routine job tasks	
	I have no strong opinion	

Satisfaction Rating	
0	0

Please explain why:

Written responses in this area are compiled and summarized in the Survey Summary.

- 12 Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA saves me a lot of time and effort in my job-related tasks	
	The PDA increased the amount of time and effort necessary to accomplish my job-related tasks	

Satisfaction Rating	
0	0

Please explain why:

Written responses in this area are compiled and summarized in the Survey Summary.

- 13 I found myself creating tasks to use my PDA for although I previously did not think I needed them while mobile.

Week 2		Week 4
	TRUE	
	FALSE	

Satisfaction Rating	
0	0

14 Please list and explain any additional tasks you would have liked to have been able to automate on your PDA:

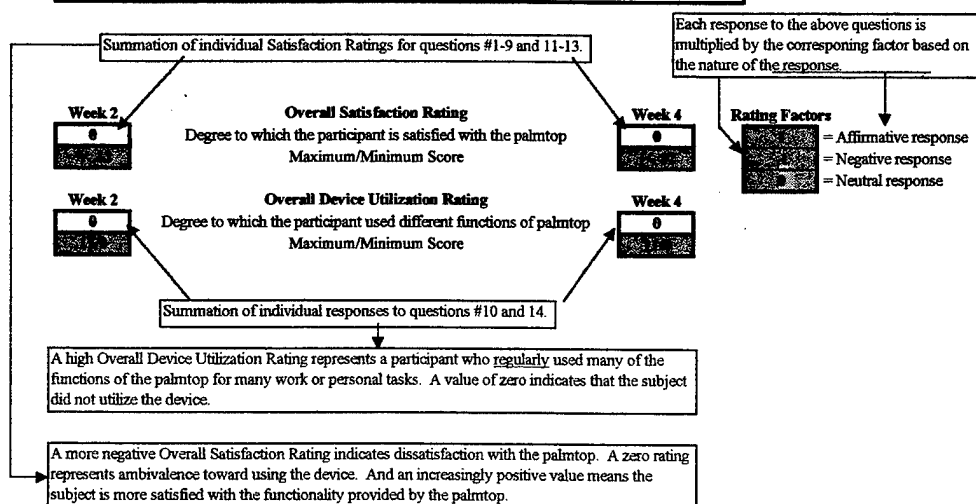
Responses to this question would be quantified and added to the total for Question # 10 to compute the Overall Device Exploration Rating found at the bottom of the page.

15 Please list and explain any complaints you have regarding your PDA:

Complaints are compiled and summarized on the Survey Summary to determine trends of likes and dislikes of this device.

16 Please use the remaining space and the back of this page for additional comments:

Responses are compiled and summarized on the Survey Summary and utilized as applicable.



NPS-SOPCP Palmtop Technology Survey

Subject # 1

Question

1 Are you satisfied with the interface between your PC and your PDA?

Week 2		Week 4
1	YES, I am satisfied	
	NO, I am not satisfied	
	I do not need to interface my PDA with my PC	1

Satisfaction Rating
1 0

2 The size of the PDA (please indicate one):

Week 2		Week 4
	encouraged me to carry it with me and use it	
	discouraged me from carrying it with me and using it	1
1	had no influence in my use of it	

Satisfaction Rating
0 -1

3 The manner in which data is entered into the PDA (please indicate one):

Week 2		Week 4
	encouraged me to carry it with me and use it	
1	discouraged me from carrying it with me and using it	1
	had no influence in my use of it	

Satisfaction Rating
-1 -1

4 Overall, the PDA is (please indicate one):

Week 2		Week 4
	convenient to use	
1	inconvenient to use	1

Satisfaction Rating
-1 -1

5 I believe all Naval officers could benefit from using a PDA in their jobs.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating
-1 -1

6 I am considering procuring (either buying it yourself or allocating OPTAR funds) a PDA for use in my job.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating
-1 -1

7 I am considering buying a PDA for my personal use.

Week 2		Week 4
1	TRUE	
	FALSE	1

Satisfaction Rating
1 -1

8 I prefer the PDA to my previous methods of information storage and retrieval.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating
-1 -1

- 9 I believe the PDA has increased my productivity.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating	
-1	-1

Please explain why:

Had incompatible software on desktop, had to enter schedule and tasking items twice.
Main method of communication is face-to-face. Taking notes on a computer seems impersonal and not appropriate.

- 10 Please indicate all of the following functions you have utilized regularly on the PDA:

Week 2		Week 4
1	Word Processor (Microsoft Pocket Word)	
	Spreadsheet (Microsoft Pocket Excel)	
	Database (Please specify:)	
1	Calendar/Day-Timer (Calendar - Microsoft Pocket Outlook)	1
	Web Browser (Microsoft Pocket Internet Explorer)	
	Presentations (Microsoft Pocket PowerPoint)	
1	Email (In-Box - Microsoft Pocket Outlook)	
1	Contact Management/Address Book (Microsoft Pocket Outlook)	1
	Handwriting Recognition (Calligrapher)	
	Other (please specify:)	

- 11 Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA simplifies my routine job tasks	
1	The PDA complicates my routine job tasks	1
	I have no strong opinion	

Satisfaction Rating	
-1	-1

Please explain why:

I receive/send a large volume of email daily. I typically receive only during regular business hours and rarely have to access it at home.
I ended up not using it the last 10-14 days of the study - I was too busy!

- 12 Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA saves me a lot of time and effort in my job-related tasks	
1	The PDA increased the amount of time and effort necessary to accomplish my job-related tasks	1

Satisfaction Rating	
-1	-1

Please explain why:

I had to spend time trying to learn/figure things out - time I don't have.
I did not like the handwriting recognition program - it didn't like my handwriting and I ended up having to correct all the time. So, I gave that function up after the second day.

- 13 I found myself creating tasks to use my PDA for although I previously did not think I needed them while mobile.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating	
-1	-1

- 14 Please list and explain any additional tasks you would have liked to have been able to automate on your PDA:

NONE

- 15 Please list and explain any complaints you have regarding your PDA:

Size: It was not easy to carry it around. Can't put it in a uniform pocket. I was worried I'd drop it! So, it was inconvenient like an extra burden to carry around.

Keyboard: not bad for a small machine.

Screen: Quite readable.

Handwriting recognition software - (see # 12)

- 16 Please use the remaining space and the back of this page for additional comments:

Fascinated with the technology! Love the idea of it - can see real potential.

But just didn't end up being the kind of tool I need in this job.

I ended up not using it the last 10-14 days of the study. I was too busy!

Week 2
-7

Overall Satisfaction Rating
Degree to which the participant is satisfied with the palmtop
Maximum/Minimum Score

Week 4
-11

Rating Factors
= Affirmative response
= Negative response
= Neutral response

Week 2
5

Overall Device Exploration Rating
Degree to which the participant used different functions of palmtop
Maximum/Minimum Score

Week 4
2

NPS-SOPCP Palmtop Technology Survey

Subject # 2

Question

1 Are you satisfied with the interface between your PC and your PDA?

Week 2		Week 4
1	YES, I am satisfied	1
	NO, I am not satisfied	
	I do not need to interface my PDA with my PC	

Satisfaction Rating
1 1

2 The size of the PDA (please indicate one):

Week 2		Week 4
1	encouraged me to carry it with me and use it	
	discouraged me from carrying it with me and using it	1
	had no influence in my use of it	

Satisfaction Rating
-1 -1

3 The manner in which data is entered into the PDA (please indicate one):

Week 2		Week 4
1	encouraged me to carry it with me and use it	
	discouraged me from carrying it with me and using it	1
	had no influence in my use of it	

Satisfaction Rating
-1 -1

4 Overall, the PDA is (please indicate one):

Week 2		Week 4
1	convenient to use	
	inconvenient to use	1

Satisfaction Rating
-1 -1

5 I believe all Naval officers could benefit from using a PDA in their jobs.

Week 2		Week 4
1	TRUE	1
	FALSE	

Satisfaction Rating
1 1

6 I am considering procuring (either buying it yourself or allocating OPTAR funds) a PDA for use in my job.

Week 2		Week 4
1	TRUE	
	FALSE	1

Satisfaction Rating
-1 -1

7 I am considering buying a PDA for my personal use.

Week 2		Week 4
1	TRUE	
	FALSE	1

Satisfaction Rating
-1 -1

8 I prefer the PDA to my previous methods of information storage and retrieval.

Week 2		Week 4
1	TRUE	
	FALSE	1

Satisfaction Rating
-1 -1

- 9 I believe the PDA has increased my productivity.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating

-1	-1
----	----

Please explain why:

- 10 Please indicate all of the following functions you have utilized regularly on the PDA:

Week 2		Week 4
	Word Processor (Microsoft Pocket Word)	
	Spreadsheet (Microsoft Pocket Excel)	
	Database (Please specify: _____)	
1	Calendar/Day-Timer (Calendar - Microsoft Pocket Outlook)	
	Web Browser (Microsoft Pocket Internet Explorer)	
	Presentations (Microsoft Pocket PowerPoint)	
	Email (In-Box - Microsoft Pocket Outlook)	
1	Contact Management/Address Book (Microsoft Pocket Outlook)	
1	Handwriting Recognition (Calligrapher)	
	Other (please specify: Really didn't use it much _____)	1

- 11 Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA simplifies my routine job tasks	
	The PDA complicates my routine job tasks	
1	I have no strong opinion	1

Satisfaction Rating

0	0
---	---

Please explain why:

- 12 Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA saves me a lot of time and effort in my job-related tasks	
1	The PDA increased the amount of time and effort necessary to accomplish my job-related tasks	1

Satisfaction Rating

-1	-1
----	----

Please explain why:

- 13 I found myself creating tasks to use my PDA for although I previously did not think I needed them while mobile.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating

-1	-1
----	----

- 15 Please list and explain any complaints you have regarding your PDA:**

GPS receiver	Space for keys, cash, ID, checkbook
TV reception	
AM/FM receiver	
Printer	
Scanner	
Digital camera	
Voice memo recorder	
Flashlight	

- 15 Please list and explain any complaints you have regarding your PDA:**

- Still too bulky
- Needs voice input/output
- Output from name/address/telephone database is not useful
 - needs database reporting flexibility
- Needs a good monthly calendar printout.
- Needs keychain locking lug.

- 16 Please use the remaining space and the back of this page for additional comments:**




--	--

Week 2
-7

Overall Satisfaction Rating	
Degree to which the participant is satisfied with the palmtop	Maximum/Minimum Score
1	100/0
2	90/10
3	80/20
4	70/30
5	60/40
6	50/50
7	40/60
8	30/70
9	20/80
10	10/90
11	0/100

Week 4
-7

Rating Factors

	= Affirmative response
	= Negative response
	= Neutral response

Week 2

4

Overall Device Exploration Rating
Degree to which the participant used different functions of palmtop
Maximum/Minimum Score

Week 4

2

NPS-SOPCP Palmtop Technology Survey

Subject # 3

Question #

1 Are you satisfied with the interface between your PC and your PDA?

Week 2		Week 4
	YES, I am satisfied	
	NO, I am not satisfied	
1	I do not need to interface my PDA with my PC	1

Satisfaction Rating	
0	0

2 The size of the PDA (please indicate one):

Week 2		Week 4
	encouraged me to carry it with me and use it	
1	discouraged me from carrying it with me and using it	1
	had no influence in my use of it	

Satisfaction Rating	
-1	-1

3 The manner in which data is entered into the PDA (please indicate one):

Week 2		Week 4
	encouraged me to carry it with me and use it	
1	discouraged me from carrying it with me and using it	1
	had no influence in my use of it	

Satisfaction Rating	
-1	-1

4 Overall, the PDA is (please indicate one):

Week 2		Week 4
	convenient to use	
1	inconvenient of use	1

Satisfaction Rating	
-1	-1

5 I believe all Naval officers could benefit from using a PDA in their jobs.

Week 2		Week 4
1	TRUE	
	FALSE	1

Satisfaction Rating	
1	-1

6 I am considering procuring (either buying it yourself or allocating OPTAR funds) a PDA for use in my job.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating	
-1	-1

7 I am considering buying a PDA for my personal use.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating	
-1	-1

8 I prefer the PDA to my previous methods of information storage and retrieval.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating	
-1	-1

- 9 I believe the PDA has increased my productivity.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating	
-1	-1

Please explain why:

- 10 Please indicate all of the following functions you have utilized regularly on the PDA:

Week 2		Week 4
	Word Processor (Microsoft Pocket Word)	
	Spreadsheet (Microsoft Pocket Excel)	
	Database (Please specify: _____)	
1	Calendar/Day-Timer (Calendar - Microsoft Pocket Outlook)	1
	Web Browser (Microsoft Pocket Internet Explorer)	
	Presentations (Microsoft Pocket PowerPoint)	
	Email (In-Box - Microsoft Pocket Outlook)	
1	Contact Management/Address Book (Microsoft Pocket Outlook)	1
	Handwriting Recognition (Calligrapher)	
	Other (please specify: _____)	

- 11 Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA simplifies my routine job tasks	
1	The PDA complicates my routine job tasks	1
	I have no strong opinion	

Satisfaction Rating	
-1	-1

Please explain why:

- 12 Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA saves me a lot of time and effort in my job-related tasks	
1	The PDA increased the amount of time and effort necessary to accomplish my job-related tasks	1

Satisfaction Rating	
-1	-1

Please explain why:

- 13 I found myself creating tasks to use my PDA for although I previously did not think I needed them while mobile.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating	
-1	-1

- 14 Please list and explain any additional tasks you would have liked to have been able to automate on your PDA:

Too many functions with limited capabilities

- 15 Please list and explain any complaints you have regarding your PDA:

I need a reminder unit. Not a desktop trapped in a microorganism!

- 16 Please use the remaining space and the back of this page for additional comments:

Week 2
-9

Overall Satisfaction Rating
Degree to which the participant is satisfied with the palmtop
Maximum/Minimum Score

Week 4
-11

Rating Factors
= Affirmative response
= Negative response
= Neutral response

Week 2
2

Overall Device Exploration Rating
Degree to which the participant used different functions of palmtop
Maximum/Minimum Score

Week 4
2

NPS-SOPCP Palmtop Technology Survey

Subject # 4

Question

1 Are you satisfied with the interface between your PC and your PDA?

Week 2		Week 4
1	YES, I am satisfied	1
	NO, I am not satisfied	
	I do not need to interface my PDA with my PC	

Satisfaction Rating

1	1
---	---

2 The size of the PDA (please indicate one):

Week 2		Week 4
	encouraged me to carry it with me and use it	
	discouraged me from carrying it with me and using it	
1	had no influence in my use of it	1

Satisfaction Rating

0	0
---	---

3 The manner in which data is entered into the PDA (please indicate one):

Week 2		Week 4
	encouraged me to carry it with me and use it	
	discouraged me from carrying it with me and using it	
1	had no influence in my use of it	1

Satisfaction Rating

0	0
---	---

4 Overall, the PDA is (please indicate one):

Week 2		Week 4
	convenient to use	
1	inconvenient of use	1

Satisfaction Rating

-1	-1
----	----

5 I believe all Naval officers could benefit from using a PDA in their jobs.

Week 2		Week 4
1	TRUE	1
	FALSE	

Satisfaction Rating

1	1
---	---

6 I am considering procuring (either buying it yourself or allocating OPTAR funds) a PDA for use in my job.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating

-1	-1
----	----

7 I am considering buying a PDA for my personal use.

Week 2		Week 4
1	TRUE	1
	FALSE	

Satisfaction Rating

1	1
---	---

8 I prefer the PDA to my previous methods of information storage and retrieval.

Week 2		Week 4
1	TRUE	1
	FALSE	

Satisfaction Rating

1	1
---	---

- 9 I believe the PDA has increased my productivity.

Week 2		Week 4
1	TRUE	1
	FALSE	

Satisfaction Rating

1	1
---	---

Please explain why:

- 10 Please indicate all of the following functions you have utilized regularly on the PDA:

Week 2		Week 4
1	Word Processor (Microsoft Pocket Word)	1
1	Spreadsheet (Microsoft Pocket Excel)	
	Database (Please specify:)	
1	Calendar/Day-Timer (Calendar - Microsoft Pocket Outlook)	1
	Web Browser (Microsoft Pocket Internet Explorer)	
	Presentations (Microsoft Pocket PowerPoint)	
	Email (In-Box - Microsoft Pocket Outlook)	
	Contact Management/Address Book (Microsoft Pocket Outlook)	
	Handwriting Recognition (Calligrapher)	
	Other (please specify:)	

- 11 Which of the following statements is more appropriate?

Week 2		Week 4
1	The PDA simplifies my routine job tasks	1
	The PDA complicates my routine job tasks	
	I have no strong opinion	

Satisfaction Rating

1	1
---	---

Please explain why:

The PDA does work out great for meetings, but its layout is cumbersome.

- 12 Which of the following statements is more appropriate?

Week 2		Week 4
1	The PDA saves me a lot of time and effort in my job-related tasks	1
	The PDA increased the amount of time and effort necessary to accomplish my job-related tasks	

Satisfaction Rating

1	1
---	---

Please explain why:

It saves me the hassle of retyping notes for distribution.

- 13 I found myself creating tasks to use my PDA for although I previously did not think I needed them while mobile.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating

-1	-1
----	----

- 14 Please list and explain any additional tasks you would have liked to have been able to automate on your PDA:

This PDA has more than enough tasks.

- 15 Please list and explain any complaints you have regarding your PDA:

The PDA is great but it has more of a "baby laptop" feel to it. The size is fine, but the program layout and data entry method can make most computer non-users uncomfortable. For someone to be comfortable using this, vice pen and paper, it needs more of a familiar pen and paper feel (i.e., USR's palmtop - PalmPilot)

- 16 Please use the remaining space and the back of this page for additional comments:

I have tried to use this PDA for almost every option available on it. I am not too fond of the email and the fax doesn't really substantiate its existence. To be honest, the scheduler and word processor (for note taking) are the only things that I found really useful!!

Week 2
4

Overall Satisfaction Rating
Degree to which the participant is satisfied with the palmtop
Maximum/Minimum Score

Week 4
4

Rating Factors
= Affirmative response
= Negative response
= Neutral response

Week 2
4

Overall Device Exploration Rating
Degree to which the participant used different functions of palmtop
Maximum/Minimum Score

Week 4
3

NPS-SOPCP Palmtop Technology Survey

Subject # 5

Question

1 Are you satisfied with the interface between your PC and your PDA?

Week 2		Week 4
	YES, I am satisfied	
	NO, I am not satisfied	
1	I do not need to interface my PDA with my PC	1

Satisfaction Rating

0	0
---	---

2 The size of the PDA (please indicate one):

Week 2		Week 4
	encouraged me to carry it with me and use it	
1	discouraged me from carrying it with me and using it	1
	had no influence in my use of it	

Satisfaction Rating

-1	-1
----	----

3 The manner in which data is entered into the PDA (please indicate one):

Week 2		Week 4
	encouraged me to carry it with me and use it	
1	discouraged me from carrying it with me and using it	1
	had no influence in my use of it	

Satisfaction Rating

-1	-1
----	----

4 Overall, the PDA is (please indicate one):

Week 2		Week 4
	convenient to use	
1	inconvenient of use	1

Satisfaction Rating

-1	-1
----	----

5 I believe all Naval officers could benefit from using a PDA in their jobs.

Week 2		Week 4
1	TRUE	1
	FALSE	

Satisfaction Rating

1	1
---	---

6 I am considering procuring (either buying it yourself or allocating OPTAR funds) a PDA for use in my job.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating

-1	-1
----	----

7 I am considering buying a PDA for my personal use.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating

-1	-1
----	----

8 I prefer the PDA to my previous methods of information storage and retrieval.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating

-1	-1
----	----

- 9 I believe the PDA has increased my productivity.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating	
-1	-1

Please explain why:

- 10 Please indicate all of the following functions you have utilized regularly on the PDA:

Week 2		Week 4
	Word Processor (Microsoft Pocket Word)	
	Spreadsheet (Microsoft Pocket Excel)	
	Database (Please specify:)	
1	Calendar/Day-Timer (Calendar - Microsoft Pocket Outlook)	1
	Web Browser (Microsoft Pocket Internet Explorer)	1
	Presentations (Microsoft Pocket PowerPoint)	
1	Email (In-Box - Microsoft Pocket Outlook)	1
	Contact Management/Address Book (Microsoft Pocket Outlook)	
1	Handwriting Recognition (Calligrapher)	1
	Other (please specify:)	

- 11 Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA simplifies my routine job tasks	
1	The PDA complicates my routine job tasks	1
	I have no strong opinion	

Satisfaction Rating	
-1	-1

Please explain why:

It still has some limitations. It is slow on handwriting recognition and is not set up for a notetaking function. Machine needs to be improved to be useful.

- 12 Which of the following statements is more appropriate?

Week 2		Week 4
	The PDA saves me a lot of time and effort in my job-related tasks	
1	The PDA increased the amount of time and effort necessary to accomplish my job-related tasks	1

Satisfaction Rating	
-1	-1

Please explain why:

Found myself having to re-write or type many words/phrases because the handwriting recognition software is slow and quirky.

- 13 I found myself creating tasks to use my PDA for although I previously did not think I needed them while mobile.

Week 2		Week 4
	TRUE	
1	FALSE	1

Satisfaction Rating	
-1	-1

- 14 Please list and explain any additional tasks you would have liked to have been able to automate on your PDA:

Note-taking function that bulletizes and paginates. Voice recognition would be a good addition.

- 15 Please list and explain any complaints you have regarding your PDA:

It was cumbersome to carry in uniform.

- 16 Please use the remaining space and the back of this page for additional comments:

Week 2
-9

Overall Satisfaction Rating
Degree to which the participant is satisfied with the palmtop
Maximum/Minimum Score

Week 4
-9

Week 2
3

Overall Device Exploration Rating
Degree to which the participant used different functions of palmtop
Maximum/Minimum Score

Week 4
4

Rating Factors
Rating Factors

9 = Affirmative response
1 = Negative response
8 = Neutral response

LIST OF REFERENCES

- Anthony, Robert S., "The Ultimate Personal Peripheral," *PC Magazine*, pp. 110-124, March 10, 1998.
- Forman, David, "Laptops on the Desktop: Making Use of USB," *Laptop, Buyers Guide and Handbook*, pp. 146-184, February 1998.
- Jerney, John. "First Looks at the Microsoft PalmPC," *mobilis Magazine*, February 1998.
www.mobilis.net
- Lewis, Ted, "Information Appliances: Gadget Netopia," *IEEE*, pp. 59-68, January 1998.

BIBLIOGRAPHY

- Anderson, Jon R., "Praise and Contempt," *Navy Times, Marine Corps Edition*, pp. 12-14, August 18, 1997.
- Anthony, Robert S., "The Ultimate Personal Peripheral," *PC Magazine*, pp. 110-124, March 10, 1998.
- Berst, Jesse, "Hold Off Buying a Windows CE Handheld," *ZDNet*, October 15, 1997.
www.zdnet.com/anchordesk/index.html
- Bethoney, Herb, "Handhelds Handier, but..." *PC Week*, pp. 115-118, November 17, 1997.
- Chen, Elaine C. Y., "Windows CE 2.0: Ready or Not Here It Comes," *Mobile Computing and Communications*, pp. 123-135, December 1997.
- Forman, David, "Laptops on the Desktop: Making Use of USB," *Laptop, Buyers Guide and Handbook*, pp. 146-184, February 1998.
- Jerney, John. "First Looks at the Microsoft PalmPC," *mobilis Magazine*, February 1998.
www.mobilis.net
- Lewis, Gordon, "Windows CE 2: What's New, What's Improved, What's Still Missing," *Portable Computing Direct Shopper*, pp. 74-76, February 1998.
- Lewis, Ted, "Information Appliances: Gadget Netopia," *IEEE*, pp. 59-68, January 1998.
- Miles, J. B., "Keep It Handy," *Government Computing News*, pp. 6-14, September 1997.
- Wilson, John R. and Corlett, E. Nigel, *Evaluation of Human Work*, Taylor and Francis, 1990.

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center.....2
8725 John J. Kingman Rd., STE 0944
Ft. Belvoir, Virginia 22060-6218

2. Dudley Knox Library.....2
Naval Postgraduate School
411 Dyer Rd.
Monterey, California 93943-5101

3. Marine Corps Tactical Systems Support Activity.....3
Technical Advisory Branch
Box 5171
Camp Pendleton, California 92055-5080

4. Battlegroup Staff C4I (CCDG-5).....1
Code N6
Unit 25066
FPO, AP 96601-4703

5. Battlegroup Staff C4I (CCDG-5).....1
Code N321
Unit 25066
FPO, AP 96601-4703

6. SPAWARSYSCEN SAN DIEGO.....1
Code PD-13
53560 Hull Street
Bldg 40 Room 208
San Diego, CA 92152-7309

7. SPAWARSYSCEN SAN DIEGO.....1
Code PD-15
53560 Hull Street
Bldg 40 Room 208
San Diego, CA 92152-7309

8. Roger Gulrajani.....1
Group Product Manager Consumer Appliances Marketing Team
Microsoft Corporation
One Microsoft Way
Redmond, Washington 98052-6399
9. Ross Bridges.....1
Channel Development Manager
Hewlett-Packard Corporation
3175 Bowers Ave.
Santa Clara, CA 95054-3292
10. Eric A. Godat.....1
Information Technology Management Consultant
1362 Caliente Loop
Chula Vista, California 91910-6810
11. Brian Bukosky.....1
Corporate Sales Division
Sharp Corporation
19282 Shadow Oak
Trabuco Canyon, California 92679
12. Jill Sugita.....1
Marketing Manager
MobileSoft Company
910 E. Hamilton Ave.
Suite 100
Campbell, California 95008